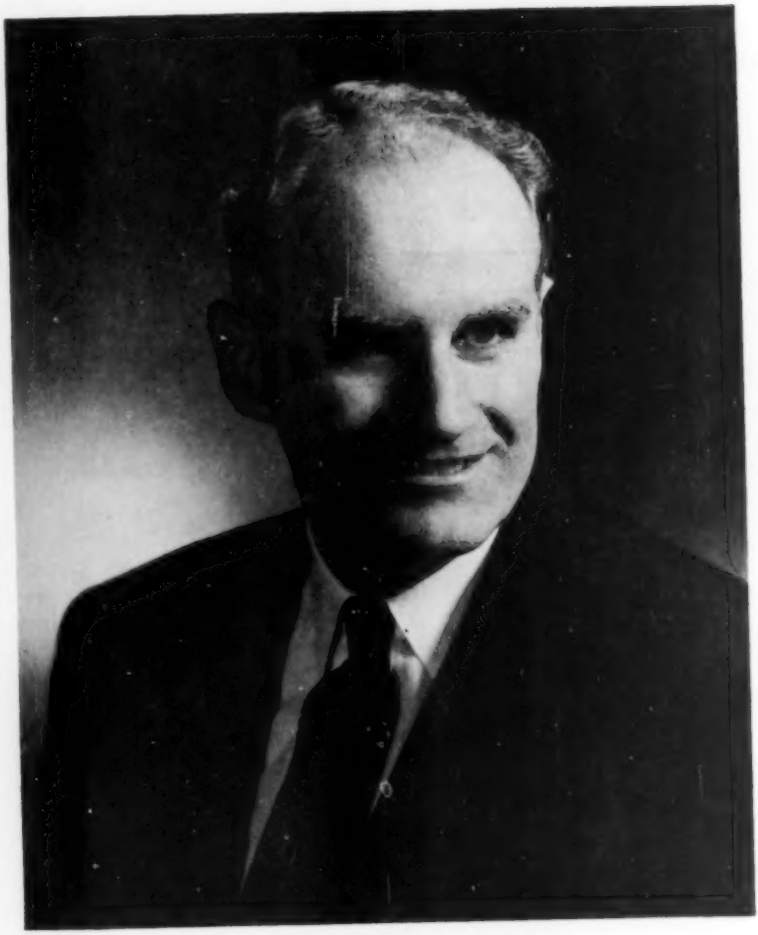
SCIENCE EDUCATION



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CLARENCE M. PRUITT, EDITOR
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RESEARCH CONCERNING THE NATURE OF CHILDREN'S IDEAS IN RELATION TO SCIENTIFIC PHENOMENA

KATHERINE E. HILL

School of Education, New York University, New York, New York

IN considering the function of science instruction at the elementary school level, among other concerns there must be concern with the place of science in society, the potentialities of science in the resolution of questions, and the developmental growth of the child.

It is difficult to over-emphasize the importance of scientific discovery and its application in our culture. The technological advances of the past thirty years have been accepted today as rather normal developments. For a short time, there was awe concerning such advances as illumination by electricity, use of antibiotics, harnessing of atomic energy, the placing of television at the disposal of the public. Soon, these and similar spectacular scientific advances were taken for granted. Indeed our younger members of society know no other way of life.

Possibly one of the greatest concerns of the elementary school should be to foster and keep alive the curiosities of our youngest citizens concerning their environment and their present and future resourcefulness in making the best use of it. By so doing, it is hoped that future adult citizens will be more actively conscious of their environment. By active consciousness is meant awareness of the possibilities of scientific research and sensibility relative to the best use by our culture of consequent discoveries. Fostering such awareness and building such sensibility is the responsibility of the layman as well as the scientist.

Some educators have proposed that the most expeditious manner in which to help children resolve their curiosities concerning the environment and develop resourcefulness concerning its use is by involving groups of them in problem solving, using the scientific method. The reasoning has been that working through a problem by posing a question, collecting and checking facts through observation and experimentation, proposing and checking a generalization will aid children in understanding and valuing the work of the scientist.

Perhaps this is true. Surely many scientific discoveries have been made in this manner, but others have not. Consider certain discoveries of such scientists as Galileo, Priestley, Oersted, Becquerel, and Fleming. Galileo did not set out to determine whether or not satellites revolved about Jupiter. He set out to observe the sky with his telescope, and in carrying out this purpose the satellites of Jupiter were discovered. Priestley had no intention of isolating oxygen in the course of his experimental attempts to "dephogisticate" air. Indeed, he missed the implication of the resulting "dephogisticated air." It was Lavoisier who named the element and discovered its importance in combustion.

Becquerel's discovery of radioactivity was not the end result of painstaking analysis of a problem, rather, it was a by-product of a sustained study of phos-

phorescent materials. It should be added, however, that Becquerel was sufficiently curious to take note of the action of a yellow salt containing uranium on a photographic plate and to investigate the cause of that action.

It is said that Oersted was aware of a possible connection between electricity and magnetism, but the method of demonstrating this relationship was a by-product of his use of electrical and magnetic materials when lecturing to students. Again, Oersted was acutely aware of phenomena in his environment and even actively curious concerning them. Consequently, he was sensitive to the result of placing a wire carrying an electric current above and parallel to a magnetic needle. Similarly, Fleming's discovery of the effects of *Penicillium notatum* was accidental. The effect of this mold on other organisms growing on an agar plate received his careful attention.

These are but a few of the perhaps countless discoveries which were accidents or else by-products of planned experiments. It would be difficult to determine whether the major portion of scientific knowledge is the result of well-planned, step-by-step use of the scientific method or the result of accident. As a matter of fact, such a debate would have little point since in both types of discovery there seem to be certain common factors in the make-up of the discoverers. Scientists are actively aware of their several environments, they note discrepancies, they investigate unusual occurrences. Perhaps it is this active awareness which should be fostered in the growing, developing child who, in his adult life, must be greatly concerned about technological advances and the use made of them in our common culture.

It seems, then, that we might well engage in recalling some of the research dealing with the nature of children and their reactions to the environment as one method for determining direction in educating children so that they retain active awareness and resourcefulness.

Each child is unique. This may be a trite statement, but the fact that each child *is* unique, possessing unique potentialities, is inescapable and should be the basis of education. Too long we have bowed to the results of group tests, to the relation of an individual's skill to the "norm," to those who attempt to mold and train an entire group of children in some particular direction. Rather, we might well consider some of the suggestions set forth by Williams [1] that teachers should be able to recognize and proceed on the basis of the individual potentialities of the learner, and, further, that children should become acquainted with their own unique potentialities early.

It is probable that each individual has his own special pattern of approaching and attempting to resolve curiosities concerning his environment. These are not mass curiosities, nor is the resolution a mass resolution. On the other hand, groups of children share certain curiosities and go about the resolution of these curiosities in somewhat similar fashion. It is because of this that children may be dealt with in groups in schools, but these groups should be small in size, so that a teacher may be able really to foster individual potentialities.

What do we know of the general patterns of child development? Havighurst points out a number of developmental tasks of the human organism some of which may be noted here. For instance, "Out of the initial buzzing confusion of the world the child discovers regularities and makes generalizations. He learns that certain images and sounds are people, who look after him and meet his needs. He learns that many particular perceptions can be grouped together and called by one name —such as *round*, or *animal*, or *man*, or

[1] Roger J. Williams, *Free and Unequal: The Biological Basis of Individual Liberty*. Austin: University of Texas Press, 1953.

good. His nervous system must have developed to a certain level of physical-chemical complexity before he can form concepts such as these. And, when his nervous system is ready, he must have the experience and the teachers to enable him to form a stock of concepts and learn the names for them. On this basis his later mental development is built." [2] Further, "By the time a child is ready to enter school he already has a store of several hundred concepts—mainly simple ones such as roundness, sweetness, redness, animal, dog, food, anger, and love. Concepts are tools to think with. . . . During the period of later childhood the individual forms several thousands concepts. If these concepts are true to reality a good share of them must have grown out of his concrete experience. Thus, as he grows older and stores up concepts, he becomes able to form new concepts on the vicarious experiences afforded by reading, or hearing lectures, or seeing movies." [3] Thus, we see that each individual must evolve his own concepts based upon his own set of experiences. As children enter and continue through the elementary school, the concepts they form concerning their environment differ even though the children may have had what appear to be identical experiences.

Thurstone [4] in his summary of research concerning primary mental abilities, those abilities needed to attain success on the conventional types of intelligence tests, indicates the special qualities of each person's mental profile even in this respect.

Further, it is necessary to recognize that the uniqueness of individuals is present at birth, and that patterns of investigation peculiar to each individual are being formed prior to the school years. Too often we conceive of children as coming to school as empty pitchers to be filled, as a mass of unformed clay to be molded. But this is not the case.

Consider a very young child. At the age of one year he gives much evidence of continuous interaction with his environment. He is able to move, to explore, to make meaningful sounds. As Josselyn points out, "He has also become progressively aware of sounds, of colors, of textures, and of possibilities for playing with objects other than those directly given to him. He is able to reach and destroy knickknacks as his own desires direct him to such activity. . . . He has motility and an ability to co-ordinate which make it possible for him to reach many new goals. These goals are the expression of primitive, impulsive desires. At first the child has no concept of forces other than his own wishes." [5]

Let us recall a child's experimentation with bouncing. Upon beginning to walk and run, he encounters certain aspects of this phenomenon. He bumps into a sofa or a chair which in turn pushes him back, sometimes causing him to topple over. He tries this again and again, especially if the action gains the amused approval of the adults in his world. Later he delights in jumping up and down on a bed or some other cushioned piece of furniture. Again, he experiences the thrust of the object on his body. This experience may be so pleasurable that he indulges in it without the approval and, at times, in spite of the disapproval of the adults in his environment. Then, there comes the first time when he bounces a ball. The ball is dropped or thrown toward the earth and it returns to him or moves off in another direction.

Certainly, we do not understand what

[2] Robert J. Havighurst, *Developmental Tasks and Education*. New York: Longmans, Green and Co., 1952. P. 13.

[3] *Op. cit.*, pp. 21–22.

[4] L. L. Thurstone, "Primary Mental Abilities," American Association for the Advancement of Science, *Centennial*. Baltimore: Horn-Shafer Co., 1950.

[5] Irene M. Josselyn, *Psychosocial Development of Children*. New York: Family Service Association of America, 1951. Pp. 49–50.

concepts this child is forming. Does he think the earth throws the ball back to him as another person might? Does he think the ball is alive? Probably we shall never be able to ferret out his understanding of this phenomenon at this age, but certainly he is not experiencing these activities as planned experiments related to gravitational pull or equal-and-opposite force reactions. Yet, it is important to note that the child keeps and is building concepts constantly, perhaps many incorrect ones and surely many incomplete ones, relating to his environment.

Let us take another example. What has the young child learned of light? He observes his mother or father manipulate a button on the wall, and, lo, there is light! Does he conceive of this light as coming from the adult's fingers? Does he conclude that this light comes out of the button? Certainly at this tender age he is not attacking the problem of the generation and transmission of electricity and its conversion to light, but he may well be forming incomplete concepts concerning this understanding. He continually constructs and reconstructs his environment, and this reconstruction is based upon new experiences.

Navarra [6] has recently presented research concerning a young child's interactions with his physical environment. He reports an interesting example of concept formation of a four-year-old in relation to the source of water supply. In July, this child asked his mother whether or not water flowing into the bathtub came from the wall. In August, there was an opportunity to observe water from streams and springs flowing into an artificial lake and water being pumped from a well. At this time, he was allowed to work the pump handle to fill a glass with water. In October, he inquired whether or not water would sour if left in a glass. In November, after being told that water flowing into the bathtub came from a large lake, the child asked if there was a pump in the wall to cause water to come into the house. It is interesting to note that this four-year-old was apparently in the process, over a period of four months, of fitting together fragmentary experiences to form a generalization concerning the entrance of water into his home.

There is need to understand much more about the process of generalization-formation in the pre-school years. This is an area of research which should prove most fruitful as a basis for future work in science instruction in the elementary school.

Now let us turn to a brief review and analysis of certain pertinent findings concerning the nature of the reactions of school-age children to their environment.

A study by Craig [7] was concerned with the determination of objectives for science instruction in the elementary school. This investigator, in analyzing questions asked by children in grades 1 through 8, indicated that a listing of nouns used by the children revealed considerable reaction with their environment. Subsequent analysis of the subject matter of the questions showed that children were involved in reacting with all phases of the environment, both physical and biological. The investigator did not claim that these questions could be relied upon as being the sole criteria for determining those phases of the environment with which children could and do react. However, among other things, this study showed conclusively that children are in continuous interaction with their environment, and are actively curious about it.

Choice of science books made by children

[6] John G. Navarra, *The Development of Scientific Concepts in a Young Child.* New York: Bureau of Publications, Teachers College, Columbia University, 1955.

[7] Gerald S. Graig, *Certain Techniques Used in Developing a Course of Study in Science for the Horace Mann Elementary School.* New York: Bureau of Publications, Teachers College, Columbia University, 1927.

was reported by Williams.[8] One phase of this study was concerned with the circulation of children's science books in nine libraries. Williams notes in her analysis of the circulation figures several interesting facts: that almost all of the books circulated well, that books devoted to physical science circulated more frequently than those devoted to biological science, and that books using a direct approach to and presentation of subject matter circulated more freely than those which involved the subject matter in a story or moralized concerning it. Again, here was evidence that children were curious about their environment, curious enough to make trips to a library to obtain books giving direct information concerning it.

Baker's[9] study of children's questions reinforces the conclusion that children are curious about their total environment. The analysis of questions asked by children in grades 3 through 6 revealed that about 37 per cent of all questions asked were directly concerned with the natural sciences. In addition, many other questions involving communication, transportation, industries and commercial products had science implications.

Studies such as these leave little doubt of the importance of their environment to children.

Several investigators have engaged in research which relates to the way in which children resolve their curiosities concerning the environment. Preston states "The spontaneous drive and curiosity of children in exploring their environment are not dissimilar to the drive and curiosity of scientists."[10]

Evidence for a statement of this kind comes from several sources. Haupt[11] investigated the ability of elementary school children to make large generalizations as an outgrowth of science experiences. He concluded that concepts are formed, not through repeating words related to a concept, but from many different learning experiences related to it. In addition, he found that children at each of the six grade levels studied, generalized concerning their experiences.

This study in the area of the natural sciences bore out findings reported by Jersild,[12] who discovered no difference in the reasoning processes of adults and children. A child, because of his more limited experience with scientific phenomena, may reach different conclusions from the more experienced adult, but the *process* of reaching these conclusions seems to be the same.

A study by Mead[13] reinforces this contention. In primitive tribes, children exhibited a definite preference for cause-and-effect explanations for natural phenomena as over and against explanations involving animism. Again, we see children reasoning in the same manner as adults.

Deutsche's[14] study of children's concepts of cause-and-effect relationships reveals no evidence that children's reasoning develops by stages. The difference in results of

[8] Alice M. Williams, *Children's Choices in Science Books.* New York: Bureau of Publications, Teachers College, Columbia University, 1939.

[9] Emily V. Baker, *Children's Questions and Their Implications for Planning the Curriculum.* New York: Bureau of Publications, Teachers College, Columbia University, 1945.

[10] Ralph C. Preston, "Defining the Purposes of Science Education in Light of the Nature of the Child," *The Forty-sixth Yearbook of the National Society for the Study of Education, Part I, Science Education in American Schools.* Chicago: The University of Chicago Press, 1947. P. 63.

[11] George W. Haupt, *An Experimental Application of a Philosophy of Science Teaching in an Elementary School.* New York: Bureau of Publication, Teachers College, Columbia University, 1935.

[12] Arthur T. Jersild, *Child Psychology.* New York: Pretice-Hall, 1940.

[13] Margaret Mead, "An Investigation of the Thought of Primitive Children with Special Reference to Animism," *Journal of the Royal Anthropological Institute of Great Britain and Ireland,* 62:173–190, 1932.

[14] Jean Marquis Deutsche, *The Development of Children's Concepts of Causal Relations.* Minneapolis: University of Minnesota Press, 1937.

thinking at various age levels depended upon accumulated experience rather than process.

McCollum,[15] in studying the maturity of elementary school children in relation to science, corroborates previous findings. He found no evidence of differing rates of maturation for understanding biological or physical science content. In addition, he indicates maturation in dealing with the content of science to be continuous and gradual.

Bergen's[16] study of the sources of children's science information discloses that eight-year-olds in classroom situations used both empirical and authoritarian sources for science information. This investigator reported that six, eight, and ten-year-olds suggested empirical sources more often than authoritarian sources of information when they were interviewed individually. It is important to note that children employ experimentation with phenomena in their environment, as well as resorting to authority, in resolving their curiosities.

Baker's[17] study concerning the choices of topics made by children in free discussions and the method of discussing those topics reveals important information. It was found, at all elementary school grade levels, that topics dealing with fact were preferred to those dealing with such subjects as fiction, evaluation or wishes. So far as method of topic discussions was concerned, there was little group discussion or "meeting of minds" among seven-year-olds, but at least half of the discussion among nine and eleven-year-olds was of this type. Children of elementary school age are concerned about the facts of their environment, but younger school-age children often find it difficult to incorporate the ideas of others in their thinking.

Oakes[18] came to certain conclusions regarding children's explanations of natural phenomena. Children's responses to questions indicated there were no definite stages in explanations which could be designated as characteristic of any particular age. Further, the great majority of children's explanations were rational, matter-of-fact and non-metaphysical. Again, however, the correctness of the child's conclusion was related to the type and amount of his experience.

A technique for observing the behavior of children was proposed by West[19] and was used by Hill[20] in reporting the contributions of children in science discussions. The latter study reveals that an analysis of the verbal responses of children in grades one through six showed that every child made responses indicating recognition and identification of natural phenomena, almost all children made inquiries concerning natural phenomena, more than 80 per cent in each grade speculated and made statements of cause-and-effect relationships, but that relatively few children made responses which could be classified as conclusions. This would seem natural if one considers conclusions to be based upon accumulated evidence. In addition, it is important to note that the majority of the children in each grade gave evidence of being critical-minded, open-minded, cooperative and re-

[15] Clifford G. McCollum, *A Technique for Studying the Maturity of Elementary School Children in Science.* University of Missouri, 1949. (Unpublished Doctor's dissertation.)

[16] Catharine Bergen, *Some Sources of Children's Science Information.* New York: Bureau of Publications, Teachers College, Columbia University, 1943.

[17] Harold V. Baker, *Children's Contributions in Elementary School General Discussion.* New York: Bureau of Publications, Teachers College, Columbia University, 1942.

[18] Mervin E. Oakes, *Children's Explanations of Natural Phenomena.* New York: Bureau of Publications, Teachers College, Columbia University, 1947.

[19] Joe Young West, *A Technique for Appraising Certain Observable Behavior of Children in Science in Elementary Schools.* New York: Bureau of Publications, Teachers College, Columbia University, 1937.

[20] Katherine E. Hill, *Children's Contributions in Science Discussions.* New York: Bureau of Publications, Teachers College, Columbia University, 1947.

sponsible. After analyzing remarks which had been recorded verbatim, this investigator concluded that the remarks of older children were more discriminatory than those of younger ones. It was suggested that the more mature thinking revealed by older children might be a result of wider experience with natural phenomena rather than a type of thinking present in later childhood but not in early childhood, since it was noted that discriminatory thinking was present at all age levels.

Subsequent studies by Haupt [21, 22, 23, 24] indicate children's early concepts to be somewhat primitive. Continued contact with materials and with the ideas of others leads to more rational understandings, however. Apparently the more mature understandings are not solely a result of living additional years but are a result of increased experience, since these understandings may appear at any age level.

A study by Stern [25] throws further light on children's reasoning concerning cause-and-effect relationships. He showed quite conclusively that the development of the reasoning process does not progress by stages or steps but is a continual process, reflecting experiences of the child. Furthermore, if a child has sufficient concrete and personal experiences, his thinking will reflect a greater degree of interaction with his environment.

A result of the research here reported, as well as additional research, has been increased emphasis on suggesting science experiences for children to elementary school classroom teachers. Such investigators as Arey,[26] Greenlee,[27] Sheckles,[28] and Young [29] have based their choices of children's possible science experiences on a study of the interactions of children with their environments.

Critical examinations of science books for children have also been undertaken. For instance, Beeler [30] reports trends in the use of analogy in presenting science information to children through books and magazines. Further studies of written material for children should be made if reading experiences are to be improved.

In summary, it seems important to note the following: the basic facts of human growth and development reveal the development of children to be continuous and gradual; research in relation to school-age children reveals that a child's understanding of his physical and biological environment is also continuous and gradual; it appears that the discoveries made by adults concerning the environment and generalizations pertaining to those discoveries are not always a result of the direct application of the scientific method; and the discoveries

[21] George W. Haupt, "First Grade Concepts of the Moon," *Science Education*, 32:258–262, 1948.

[22] George W. Haupt, "First Grade Concepts of Hot and Cold," *Science Education*, 33:272–277, 1949.

[23] George W. Haupt, "First Grade Concepts of the Moon, Part II. By Interview," *Science Education*, 34:224–234, 1950.

[24] George W. Haupt, "Concepts of Magnetism Held by Elementary School Children," *Science Education*, 36:162–168, 1952.

[25] Aaron Stern, *Children's Explanations of Physical Phenomena*. New York: Columbia University, 1951. (Unpublished Doctor's dissertation.)

[26] Charles K. Arey, *Science Experiences for Elementary Schools*. New York: Bureau of Publications, Teachers College, Columbia University, 1942.

[27] Julian Greenlee, *A Source Book of Science Experiences for the Use of Teachers of Young Children*. New York: Teachers College, Columbia University, 1949. (Unpublished Doctor's dissertation.)

[28] Mary E. Sheckles, *A Source Book of Experiences in Science in Childhood Education*. New York: Teachers College, Columbia University, 1946. (Unpublished Doctor's Dissertation.)

[29] G. Marion Young, *Children's Science Experiences for Improved Living*. New York: Teachers College, Columbia University, 1952. (Unpublished Doctor's dissertation.)

[30] Nelson F. Beeler, *A Critical Examination of the Use of Analogy in Science Writings for Children*. New York: School of Education, New York University, 1954. (Unpublished Doctor's dissertation.)

and generalizations made by school-age children seem to follow the patterns of adults.

Further research related to science in childhood education is needed. Information concerning the nature and development of the science concepts of pre-school children is meager. Additional information concerning the nature and development of the science concepts of school-age children, as well as suggestions of ways to improve materials and experiences for the implementation of concept development would be welcome. It is essential that we devote further thought to the process of aiding children to improve their value-judgments of phenomena in the physical and biological environment.

CHILDREN—CREATIVE EXPLORERS *

KATHERINE E. HILL
School of Education, New York University, New York, New York

CHILDREN are explorers, just as surely as Magellan, Byrd, the Curies, Einstein, da Vinci, Fermi, and Pasteur were explorers. We have only to look about us and observe children engrossed in their daily activities to become even more thoroughly convinced of this.

By way of example, let us consider a few of the exploratory activities of children which occurred in the space of a few days recently. One forenoon there came the sound of excited banging on the front door, caused by two pairs of small fists. Upon opening the door, Monty, my six-year old neighbor, and his good friend Brian, a five-year old, burst into the room lugging a large, cardboard carton. They set the carton down triumphantly in the middle of the living-room floor, whereupon Monty exclaimed, "Brownie is visiting me today because it's a holiday!" Upon investigation, I discovered that Brownie, a guinea pig, was the pet of the first grade at the school in my neighborhood. It was fascinating to watch the two boys become immersed in active exploration of the guinea pig. They rubbed the fur the right way, then the wrong way. Brownie was placed in the carton, and eager eyes watched him burrow beneath the strips of paper. A piece of carrot was offered him, but Brownie refused it. No amount of gentle urging could induce Brownie to open his mouth. Soon Monty and Brian departed with their treasure. However, all day it was evident that other children were a part of this exploratory experience with Brownie, for from time to time groups of children gathered on the doorstep to have a part in this fascinating adventure.

Sally was only one last month, but she is a vigorous explorer also. This is apparent as one watches Sally engaged in feeding herself. A spoon, a fork, and fingers are used in turn for eating applesauce, with the fingers winning out most often.

A few days ago three three-year-olds, bundled up in snowsuits, were playing near the sandbox below my window. They tumbled about in the snow until Holly moved toward the sandbox and attempted to sit on the edge of it. She was successful for a time, but before long she toppled backward into the box. By now, she had been joined in this exploratory activity by the other three-year-olds. Eagerly they attempted to balance their round, small bodies on the edge of the upturned board. Then over they would go. Again and again, they tried this.

Or let me think of Cindy for a moment.

* Paper presented at the National Council for Elementary Science Meeting, New York, New York, March 17, 1956.

Cindy is about two and a half. By now, she walks quite well, so well, in fact, that she eagerly pushes her stroller about. Her explorations with the stroller are not limited to the smooth sidewalk area, for Cindy pushes the stroller all about the back lawn, which is none too smooth. Occasionally, Cindy falls, but soon she is up again and moving off in a different direction.

It seems to me that each of these children typifies the thousands of children who set about exploring their surroundings each day. These explorations continue from morning until night, almost without ceasing. Certainly, these children appear to be following Webster's definition of *explore:* "To penetrate or range over for discovery."

But are these young children *creative* explorers? Perhaps they are, especially if we consider one of Webster's definitions of *create:* "To invest with a new form, office, or character." Although we cannot be certain, it seems that each of these children is experiencing his environment and thereupon investing those experiences he has with a new form, This is possible because *he* does the exploring, the investigating. The ensuing character or form which these experiences take is more than the mere total of the experiences. Furthermore, the form is different from the character or form which would occur if another child had similar experiences. In a sense, then, even the youngest child is a creative explorer as he orients and reorients himself in his environment.

Let us analyze, briefly, additional experiences which children have had to determine if there is a further clue concerning creative exploration. Last fall, Monty, the six-year old, came time after time to my study to search for information concerning dinosaurs. In this instance, his field of exploration was in the realm of words and illustrations, which depicted the ideas of others. With his father, Monty would search through the written material until he had found the answer to his question concerning dinosaurs. Then the books would be returned. In a few days, he would request the same books for use in determining the answers to further questions. Again the books would be returned. This process continued for weeks as Monty apparently explored and created images and ideas for himself.

Or let us turn to Charlie, an eight-year-old with whom I was riding one afternoon. After a period of silence, he turned to me and asked whether or not there had been a thunderstorm at my house the afternon before. My answer was affirmative. At this point, Charlie said, "I thought so, because as I was looking out my window yesterday afternoon in the direction of your house, I could see cumulo-nimbus clouds." Here, it appears, is evidence that an eight-year-old was creatively exploring. Charlie was using previously gained ideas in a creative manner to emerge with his own tentative answer to a question.

A group of eleven-year-olds considered the possibility of travel to Mars. In the discussion of this problem, various bits of information were related; other information was gleaned from books and from informed adults. This was a time of creative exploring—exploring to formulate an answer to the problem.

Monty's explorations, Charlie's explorations, the sixth-graders' explorations appear to be somewhat different from those of Sally when she attempts to eat her applesauce or of Cindy when she pushes her stroller. Perhaps they are illustrations of a second meaning Webster gives to *create:* "To produce as a work of thought or imagination." This meaning of create implies purpose. It is the difference between using muddling dough or clay for the fun of manipulating it or using such material to create an object of beauty. In the former instance, exploration of the material is present, and this is all to the good. It is a necessary step toward the creative exploration involved in producing a pleasing shape. From time to time, children, as do adults,

move back and forth between the purely exploratory and the creative-exploratory experiences. But as each individual matures, exploration becomes purposeful more frequently; that is, it becomes creative more and more often.

Those ideas which have evolved through the process of creative exploration may take different final forms. They may appear as words, transmitted verbally or in writing, or they may appear as objects or manipulations of objects, which also may be perceived by others.

This step in the process of creative exploration, that of transmittal to others, is the step which allows the explorer to become more completely a part of the stream of life which preceded him and which moves along with him. He takes ideas and the results of action from others and makes these a part of himself. But this is not enough. Through his own words and actions, the creative explorer transmits his ideas to others, thus his experience is shared and becomes a part, in its turn, of the creative explorations of others. This satisfying step is the one, possibly, which leads many children to further creative explorations.

It seems clear, then, that children *are* creative explorers. That children have the desire and ability to explore and to create is in evidence all about us. One need not be concerned about rousing such desires and abilities in normal young children, as these desires and abilities seem to be present at birth. Our challenge is to be sure that children are given ample opportunity to be creative explorers after they enter school. Sometimes the curriculum becomes so crowded with facts to be learned, with various facets of the cultural heritage to be absorbed, with numerous skills to be acquired that there is little time for creative exploring and the sharing of the results of those explorations.

Perhaps we need to reconsider the place of science in our individual elementary school curriculums from time to time. We might question ourselves as to whether or not children have opportunities for creative exploration in this area. Are we so concerned about children's retention of certain science facts that we fail to provide opportunity for the thoughtful exploration of ideas by individuals and by groups? For instance, it is impossible to predict accurately the amount of time necessary to explore the use of dry cells, wires, sockets, bulbs, and switches by a group of children. There must be opportunity to test ideas concerning setting up an electric circuit by use of the materials provided. There must be opportunity for exploring in books to test one's own ideas against the ideas of others. There must be time to use these materials in creating a circuit which is satisfying to those who are working with it. There must be time for the teacher to encourage, question, and challenge. And there must be time for the transmittal of ideas to others who are interested in this creative exploration.

Some would say that the same results would be obtained concerning the understanding of an electric circuit if the teacher or a child set up the circuit and demonstrated it to a group of children. In the light of our present understanding of theories of learning, certain end results *might* be obtained by the use of either method. For instance, the learner could readily see by observing his teacher's demonstration that it is possible to make a bulb light by using a dry cell and wires. He could come to this conclusion also by using the materials himself to cause the bulb to light.

But there is a difference in these two approaches and a difference in the total end results. The deep satisfaction which comes to the creative explorer as he reaches his final solution is something more than the interest of the observer, however great, in an object, a process, or an idea being transmitted to him by the one who has done the exploring. If creative exploration is allowed to fall by the wayside, some of

the most promising and exciting opportunities for learning are lost. In addition, there is necessity for the sharing of ideas and information gained, where the sharer is the teacher, a child, or a group of children. Certainly, each of these processes is important in learning about the environment, and a program of science education for young children should be flexible enough so that both processes can be used.

The field of science in the elementary school, with its wealth of readily-available science materials, science books, science films and slides, science television programs, as well as the living and non-living natural environment, holds great potentialities for the creative explorations of children. Surely we are able to provide the time, the space, the materials, the patience, the flexibility which is necessary for children to go about the business of creative exploration in science. Surely we can provide the sympathetic guidance which challenges each child to more and more purposeful action, always keeping in step with his tempo and never losing sight of the fact that this child is in constant interaction with the world about him. Surely we can provide opportunities for dealing with ideas through discussion. Surely we can arrange for the sharing of the results of creative explorations by children.

As thoughtful educators, we recognize that each child has a certain creative potential in science, and we know that this creative potential can be released if the opportunity exists. When we provide the opportunity and sympathetic, understanding guidance, the reward is watching children build basic understandings concerning their total environment, understandings which can never be as deep nor as broad if creative explorations and the sharing of the results of those explorations are curtailed.

Our place in this process of exploration is to help children move, when they have attained sufficient maturity, from the large, encompassing, sampling, tentative stage of exploration to that stage where exploration is used purposefully—where focus is achieved. This purpose may be to answer a question or a challenge accepted by the child as important. Or the focus may occur through conscious fusion and synthesis of explorations so that a meaningful pattern is apparent, even though a specific purpose was not formulated at the outset of the series of explorations. If we are able to build an atmosphere in which this type of thoughtful, purposeful activity may take place, then we shall have the opportunity of moving ahead in our roles as guides of children—creative explorers.

TEACHING CREATIVELY *

N. Eldred Bingham
School of Education, University of Florida, Gainesville, Florida

To teach creatively one must either discover or awaken interests in children and then develop these interests. Teaching must of necessity be directed to individuals and to small groups. It must be adjusted to a wide range of ability, interests, and ambitions. It cannot be a lock-step, class-dosage type of experience. The boys and girls must share in the planning activities as well as in the doing activities. All will not learn exactly the same things, although most of the members of any class will learn many of the same things. Able and interested and ambitious children will be stimulated to do their best.

Each will be encouraged to develop his unique talents. Some will learn to read and write and figure, using quite different

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materials than others. Of course, for particular techniques certain materials may be used by all—but this common experience will comprise but a small part of the total class activity. Reference materials of many kinds will be used extensively in connection with the solving of problems or the doing of projects. Many experiments will be done. Parents and other resource people will be in the classroom frequently. Trips will be taken. The room will be alive with activity—sometimes even noisy—but the noise will be in connection with the purposeful activity of the children. Each child will be striving to do his best and he will expect the best from his classmates.

The enthusiasm and devotion of the teacher will permeate the room. In short, the teacher will have arranged a situation where each child is stimulated to think and act creatively and is concerned to help others do the same.

How does a teacher discover and develop the interests of her children?

1. A teacher cannot discover children's interests.
   a. By directing, telling, assigning pages to be read and testing for mastery of what has been said or read.
   b. By showing audio visual materials, and at the same time telling the children what they should see and hear and think and by having them record these items in a notebook.
   c. By giving lectures and demonstrations which the children merely observe and record.
   d. By drilling on material she thinks the children should learn.
   e. By using texts as a course of study to be followed and memorized.

2. A teacher may discover childrens interests:
   a. By getting children to talking and listening to what they say. By finding:
      (1) What they like to talk about.
      (2) What they like to do.
      (3) What they are informed about.
      (4) Where they have been.
      (5) Whom they know about.
   b. By looking for their interests in their many experiences. For example:
      (1) In the road being built in front of their home.
      (2) In their home—kitchen utensils—appliances—4-H club activities—heaters—motors—air conditioners—pets—fire safety.
      (3) In the yard—flowers—shrubs—vegetables — insects — birds — streams — power mowers—hand tools.
      (4) On the farm—raising cattle, sheep, pigs, horses, bees—using tractors, trucks and other power operated tools—hybrid varieties of plants and animals—management of soils, fertilizers, erosion—control of insects and diseases—irrigation and drainage.
      (5) In relation to health—control of communicable diseases good nutrition—care of sick—disposal of wastes—softening water—providing pure water—keeping air pure.
      (6) In relation to wild life—trees, flowers, birds, fish, mammals, insects, turtles, snakes.
      (7) In relation to applications of science in:
         (a) construction — bridges — buildings —ships —roads — airports — automobiles.
         (b) locomotion — railroads — airplanes—motor scooters—bicycles—boats—automobiles.
         (c) communication — telephones —telegraph—teletype radio—television.
         (d) travel—geology and biology as seen in national monuments and parks—out-of-door experiences as camping, fishing, hunting, swimming, and hiking.

3. A teacher may awaken an interest in children by providing an enriching experience out of which questions and problems arise. She might do an interesting experiment, share a story or a current event, show a film, provide an interesting speaker or take them on a trip. She can then observe the children and listen to their reactions, thereby discovering what interests she has awakened.

4. A teacher may begin to develop interests that have been discovered or awakened in the children by questioning them regarding the interest until she pushes them to a point where they do not know the answer, where they feel a need to investigate, where they recognize that they have *inadequate* data to answer the question. Then she helps them plan activities to get the data needed to answer the question or to solve the problem.

   Or by questions she pushes the children to a point where data conflict; two things the children believe disagree, they cannot both be true—the data are *disharmonious*. Then she helps them plan activities to get the data to find which idea is right—to arrive at a concept which harmonizes with what is known.

   Finding the answer may involve making something, doing an experiment, using a

guidebook, determining what experts think, determining to what extent it is true, reading accounts of similar occurrences, collecting and studying samples to find if something is true.

For example, suppose boating and swimming and water skiing are being discussed. Some of the questions which might be used to push children to a need for investigation are:

a. What makes the boat float deep in the water when at rest yet ride on top of the water when going fast?
b. How is the boat held up when floating?
c. Will it sink deeper if more people get into the boat? Why?
d. What will happen if the boat fills with water?
e. What happens to the water beneath the boat as people get into the boat?
f. Why is it hard to swim under water with lungs full of air?
g. Why is it hard to swim on top of the water with the lungs relatively empty of air?
h. Can one lift as big a stone in the air as in water? Why or why not?
i. What makes some things sink while other float?
j. Will a boat float higher or lower in salt water? Why or why not?

By such questions children may be stimulated to experiment with buoyancy. They might see if they can make an egg float in water by adding salt to the water (use a storage egg that will almost float in fresh water). Or they might try weighing things in air and in water to see how much water holds up things. Then they might measure the water pushed out (displaced) to see if it weighs the same as the buoyant force exerted by the water. They might even weight objects in fresh water and in salt water, or in fresh water and in kerosene or alcohol or carbon tetrachloride to see if heavier liquids buoy with greater force.

Regarding how the boat and skiiers are hold up when going fast—they might experiment to see that swimmers, and boats, and airplanes are moved forward by pushing water or air backwards; are held up by pushing water or air downwards.

Or to take another example, children might be talking about how dew is formed—and by questions and discussion the teacher discovers that they know that dew forms on cold objects where water vapor in the air comes in contact with cold objects—that frost forms if the cold objects which the water vapor strikes are below freezing. How then are clouds formed? It must be that vapor condenses on dust in the air as air cools. Why not try to make a cloud. Take a gallon jug—wet the air in it with water—add smoke for dust—then warm it to evaporate water into the air and then cool it to make the water vapor condense. Warm it by compressing the air in the jug and cool it by letting the air out. This can be done by blowing into the jug.

This same approach can be used when stimulating further study of living or non-living objects. Question children regarding the object by asking:

What it is?
Where is it found?
What is it like?
How is it different (from something similar)?
How can you find out what it is?
What is it called?
What other names does it have?
What can you do with it?

By this approach children become accustomed to checking on the *adequacy* and the *harmony* of the data back of any conclusion. This is a way to get dependable answers.

A similar approach works in deciding what to do—in developing good judgment in determining one's activities. A child can be helped to anticipate the consequences of alternative courses of action—he can then list the limitations and the advantages of each alternative course of action, and in the light of these anticipated limitations and advantages make the choice of what do do. In making his choice in this way, a child recognizes the limitations as well as the advantages of his decision, and so is more apt to be happy with the alternative he has chosen.

5. A teacher may extend childrens' interests by:
   a. Getting them involved in creative investigations regarding the interests she discovers.
   b. By helping them relate their particular problem to similar instances in the past or present, in the immediate or remote environment.
   c. By having them make and use many kinds of audio-visual aids experiments—graphs—working models—slides—films—movies—et al.
   d. By having them share their discoveries, their creations, with others, with the teacher questioning them and the class about what is happening, what makes it happen, its significance, other instances, and what might happen under other conditions.

By the above procedures the classroom becomes a work shop—children live a scientific approach in most all that they do.

a. They make observations—and by thought and discussion define problems.
b. They formulate guesses (hypotheses) to account for what they have observed, to answer the question or solve the problem they have formulated.
c. They check hypotheses with their own ex-

perience, with recorded experience, by further observations, by means of experiments and with experts to see if their data are adequate and if their hypotheses are in harmony with all that is known.

d. They accept, or reject and make new hypotheses and on and on in the light of the test of harmony.

They arrive at dependable answers by applying the tests of the adequacy and harmony. They make wise decisions by anticipating the consequences of their acts and then making their decisions in the light of the desirability of alternative courses of action.

In a classroom where these procedures are to be found, thinking and doing are emphasized—children plan with the teacher what to do—how to do it; children evaluate with the teacher the results of their actions; children work at a maximum for they have a high level of interest; children learn to live in helpful ways with one another; science becomes a part of all that they do—not something set apart for special study.

Following are several examples of how creative teaching can be done by discovering, developing, and extending the interests of children. The questions illustrated are:

How does gravity work?
What makes it warmer in summer than in winter?
How are day and night caused?
How are the seasons caused?
What makes the moon appear to change its shape?
How are things warmed?
How do magnets act?

HOW DOES GRAVITY WORK?

1. Does gravity attract everything?

By referring to children's experiences establish that:

a. everything is pulled toward the earth. That we are oriented in space with regard to gravity—down is toward the earth—up is away from the earth, no matter where we may travel. In China up is in the opposite direction from in the U.S.A.

b. the moon is pulled toward the earth—and but for the centrifugal force due to its eastward motion around the earth it would fall into the earth.

c. the sun and other planets are pulled toward the earth and the earth is in turn pulled toward other distant bodies, as is evidenced by the tides which are caused by the gravitational pull of the moon and the sun; and also by the movements of the planets—ever falling toward the sun—and ever moving in an easterly direction so that their orbits or paths are a dynamic balance between the attraction of gravity and the centrifugal force created by the tendency of these planets to keep moving in a straight line.

It was by observing the motions of the moon that Newton was able to formulate his law of Universal Gravitation, which states that every object in the universe attracts every other object with a force that is directly proportional to the mass of the objects and inversely proportional to the square of the distance between them.

By observing the position of the moon, and Venus, and Jupiter on successive nights one can observe that these objects shift their positions among the stars. By looking at these objects early in the evening and then later again the same evening, one can see that they appear to have moved westward. This motion one can account for by assuming that the earth rotates or spins to the east.

By looking at the moon on many evenings one notes that it appears different—with a new moon always in the west, a first quarter moon to the south, and a full moon to the east. One can account for the eastward motion across the sky from night to night by assuming that the moon goes around the earth from west to east. Thus one constructs a picture of the solar system which harmonizes with all that one observes—this is the essence of creative thinking.

And if a telescope is available one can see what Galileo saw and recreate the picture of the solar system as he constructed it, for one observes that Venus goes through different phases like the moon, and one observes four little moons near Jupiter. Sometimes two of these moons will be on each side of Jupiter, sometimes three will be on one side and one on the other, sometimes only three will be visible, and so on. The small moons must revolve around the big planet Jupiter. Similarly the earth's moon must revolve around it, and the planets must revolve around the sun.

Thus by these careful observations and by creative thinking in connection with them, the nature of the solar system comes to be understood. The law of gravitation is seen in relation to everything in the universe, not just as it appears in our own limited activities here on the surface of the earth. Children gain security from increased understanding.

It should be possible to illustrate how a balance between inertia (centrifugal force) and gravity hold the planets and their satellites in their orbits. If one ties a small ball and a large ball together by a string free to slip through a tube, it is possible to whirl the small ball and make its centrifugal force overcome the pull of gravity of the large ball. This is the case with the planets—those closer to the sun have a much shorter period of revolution than these further away. It can be shown that the small ball will have to go around much faster if its orbits are small than when its orbit is large.

2. Do heavy objects fall toward the earth faster than light objects?
   a. Compare the rate at which a ping pong ball and a marble fall.
   b. Compare the rate at which a crumpled piece of paper and an open sheet fall.

3. What makes some things stay put while others are easily pushed around or fall of their own accord?
   a. Compare the stability of a book when lying on the table, when standing on end, and when placed on a corner.
   b. What makes a football come to rest on its side rather than on its end?
   c. How does it happen that a ball will stop in any position yet is easily pushed from place to place?
   d. How does a board suspended above, below, and at the center of gravity illustrate stable, unstable and neutral equilibrium?

WHAT MAKES IT WARMER IN SUMMER THAN IN WINTER?

1. Is the earth warmed by the sun?
   By referring to children's experiences establish that the earth is warmed by sunlight, for the sunlight feels warm; it is warmer during the day than at night, and the sunlight feels warmer when not obscured by clouds.

2. Is the sunlight more intense in summer than in winter?
   a. Compare the altitude of the sun at noon in summer and winter.
   b. Demonstrate that when the sun is more nearly overhead, its rays are more intense.

3. Are there more hours of sunlight in summer than in winter?
   a. Compare the hours of sunrise and sunset in summer and in winter.
   b. Compare the relative hours of daylight and darkness in summer and in winter.

4. Will more light be reflected and absorbed by the earth's atmosphere in winter or in summer?
   a. By diagram show that the light striking the earth obliguely goes through a greater thickness of atmosphere.
   b. Recall that clouds and dust lessen the intensity of sunlight which reaches the earth's surface.
   c. Illustrate that chalk dust reflects and absorbs light.

HOW ARE DAY AND NIGHT CAUSED?

1. Show that day and night could be caused by the rotation of the earth.

2. Show that day and night could be caused by the sun going around the earth each day.

3. Conclude that the explanation we accept must be in harmony with all other observable phenomena.

HOW ARE THE SEASONS CAUSED?

1. Recall that there must be more hours of sunshine and more direct sunshine in summer than in winter.

2. Demonstrate that if the earth spins on its axis and also goes around the sun with its axis inclined to the plane of sunlight reaching the earth, that it is possible to account for the seasons as well as day and night.

WHAT MAKES THE MOON APPEAR TO CHANGE ITS SHAPE?

1. Establish by discussion and from observation that the light of the moon is reflected sunlight.

2. Demonstrate that if the moon goes around the earth, it would appear to change its shape

HOW ARE THINGS WARMED?

Objects which appear brilliant in light apparently reflect most of the light energy which strikes them, while objects which appear dull or dark when in light apparently absorb much of the light energy which strikes them. Still other materials such as glass apparently transmit much of the light energy which strikes them. It is reasonable to assume that light energy may be reflected, absorbed, or transmitted when it strikes something.

1. To find if light energy is reflected place a mirror or a piece of shiny metal in front of a radiant light or heater. Is some of the light reflected? Is a thermometer warmed by the reflected light? Is the miror or metal warmed by the light? Does the light pass through the mirror or metal? Is a thermometer placed behind the mirror or metal warmed?

2. To see what happens when light or heat energy strikes a pane of glass, place two thermometers directly in front of a radiant heater or lamp, with a pane of glass placed obliquely between them. Compare the rise in temperature of the thermometer exposed directly to the radiant heater with the rise in temperature of the one exposed to the rays after they have passed through the glass. Are both thermometers warmed? Is light energy reflected by the glass? Does light energy pass right through the glass? Is the pane of glass warmed?

   Most of the radiant heat energy is absorbed by the glass, while most of the radiant light energy passes through it. Any rise in the temperature of the thermometer behind the pane of glass is due to the light energy which passes through the glass.

Similarly, most of the radiant heat energy from the sun is absorbed in the atmosphere while the light energy passes through to the earth's surface warming it. The warm earth, in turn, radiates heat energy which warms the atmosphere immediately above the surface of the earth.

3. To find if lighter or dark objects absorb radiant energy faster, place a light and a dark metal plate in front of a radiant heater and see which gets hot quicker. You can show which gets hot quicker by sticking two equal-sized sticks to the back of each plate with paraffin. The one which is warmed faster will melt the wax quicker and the stick will drop off.

   Would one be hotter wearing a dark or a light blouse in bright sunshine?

4. To find if light or dark objects radiate heat faster, fill equal-sized light and dark cans with boiling water and see which cools faster.

   Would a white stove or a black stove warm a room more effectively? A black radiator or a white radiator? Why are more radiators painted light colors than dark colors? Would a person be warmer on a cold dark night when wearing a white fur coat or when wearing a black fur coat? Account for the fact that most people wear dark colors in winter. Should they?

5. To show that heat travels by conduction, place a silver spoon in a cup of boiling water. Note that the spoon gets hot by the movement of heat up the handle.

6. To show that heat travels in air by currents (convection currents), arrange a box with a glass front and with openings at either end so that a chimney can be placed over each opening. Place a lighted candle under one of the chimneys and then, by using smoke screen chemical, $TiCl_4$, or some other means to make the air currents visible, see if air moves up or down the hot chimney, if it moves up or down the cold chimney, and how it moves within the box. The air in motion is a wind. Do the winds in the box blow from hot to cold or from cold to hot? Are the down winds hot or cold? Are the up winds hot or cold? Account for what you observe.

7. To see how heat travels by currents in liquids such as water, fill a milk bottle with cold water and another with hot water. Add some congo red dye or ink to the hot water to make it visible. Then press a card over the mouth of the bottle filled with hot water and place it over the bottle filled with cold water. Pull out the card separating the two. Does the hot water mix with the cold water? Or does it remain in the top bottle? Similarly fill two other bottles as above, but this time place the bottle filled with cold water above the bottle filled with hot water. In this case do the hot and the cold water mix? Or do they remain separate? Account for your observation.

   We can account for the convection currents in air and in water if we assume that things expand when heated. If water, for example, expands when heated, then we should expect it to weigh less, and hence be pushed up by the colder water.

8. To see if heat makes liquids expand, warm a confined liquid in an apparatus arranged to magnify any changes in volume. This can be done by filling a flask with water or some other liquid, sealing it with a rubber stopper and a glass tube, and then heating the flask. Does the liquid rise in the tube when it is heated?

9. To find if an increase in heat changes the weight of a liquid such as water, compare the weight of equal volumes of hot and cold water. To do this nearly fill each of two similar flasks with cold water and balance them on a meter stick arranged as a sensitive scale (with point of support of flasks just slightly below point of suspension of meter stick). Mark the level of water in one of the flasks—empty it and replace with hot water. Is the scale still balanced or does the hot water weigh less than the cold water. Account for any differences you observe.

HOW DO MAGNETS ACT?

1. By dipping a magnet in iron filings show that the attracting force is greatest at the ends.

2. By using two compasses needles:
   a. Name the north and south poles.
   b. See if like poles attract or repel.
   c. See if unlike poles attract or repel.

3. By deduction, determine what kind of a magnetic pole is up north.

4. By jarring a piece of steel in a magnetic field make it a magnet.

5. By magnetising a test tube full of iron filings, construct a picture of how a magnet works.

6. Using the earth's magnetism, make a magnet by jarring a long piece of steel.

CONCLUSION

The whole process I have been illustrating is creative. Boys and girls of differing abilities can work together at their own rate. They know what they experience by this process. Their memory does not

fail them, nor do they have to spend long hours in intensive drill to memorize what they need to know.

Creative teaching consists mainly in arranging the situation so that boys and girls will think and act creatively in a fashion similar to that described above. Creative teaching stems from placing the approach of science at the center of the curriculum. This approach can be used with almost any subject matter.

It works exceptionally well with natural phenomena and also in developing an understanding of the many applications of science in the man-made world which surrounds the child—a world filled with lights at the flick of a switch, automobiles, airplanes, hybrid corn, antibiotics, television, and many others.

Two reasons why it works so well in these cases are:

1. All children are curious about the things they see and hear around them. They want to know the what, and the how, and the what makes, and to what extent, of the world around them. Motivation is easy if we help children find the answers to the problems they are already committed to solve.
2. The natural phenomena and man-made devices yields simple, definite, positive answers when approached in this manner. The conclusions can be depended upon for they are based upon adequate data and upon harmony with all that is known.

This creative approach also works well in developing good judgment. Children become accustomed to making all of their decisions regarding what to do in the light of all of the consequences they can anticipate.

With such an approach at the heart of the curriculum, children can progress at their own rate, for they actively participate in planning what to do and how to do it, as well as in the doing process itself. They learn to use books as references in checking recorded experience, regarding what, and when, and how, to figure accurately in answering questions of to what extent, to speak effectively in planning what to do and in drawing conclusions, to observe carefully in what is, and what happens, and to think creatively in accounting for what happens and checking to see if the data are adequate to account for what happens, and if what happens is in harmony with what is known.

WHERE ARE WE IN ELEMENTARY SCIENCE *

Paul E. Blackwood

U. S. Office of Education, Department of Health, Education, and Welfare, Washington, D. C.

One morning last fall I was riding a suburban bus to visit an elementary school. At one of the stops a small school girl wearing a crisp dress and precise braids climbed aboard. She sat in a seat near me. She held a brand new note book in her hands. She opened it to the clean front page and spread it on her lap. She looked at the front page and caressed it with one hand. She turned the page and stroked it several times. Then she smiled and put it under her arm and relaxed. As the bus stopped at the school she grasped her new notebook and eagerly hurried toward her classroom. I could not help wondering what would go on that clean front page.

Encouraging Signs in Elementary Science Teaching

In considering the topic, *Where Are We in Elementary Science?* I shall first give several examples of good science teaching. I believe they are representative of current practices in many *good* elementary schools

* Article based on address given at the National Council for Elementary Science Meeting at Washington, D. C., April 7, 1956.

throughout the Nation. From these examples we can identify types of content, ideas and procedures which, in my opinion, characterize science teaching at its best. There are many foreward looking science programs in cities and counties throughout the country. Yet also there are many schools where not much science is taught, where teachers shy away from teaching science, and where the science that is taught is not challenging or interesting to the children.

Some people indulge in pessimism over the amount and kind of science teaching which we observe in the elementary school. But for the most part, I can only be optimistic when I observe the enthusiasm of teachers as they seek help to improve their teaching of science. In cities and counties and States throughout the Nation there are hundreds of inservice programs, workshops, and curriculum committees at work on improving science teaching in the elementary school.

Teachers are looking for help and encouragement. They are anxious and willing to learn more about the "science" that is important to children today. They want to know better methods of teaching science and wiser ways of selecting topics, questions, or areas for study.

These are all encourageing signs. It is encouraging also to know that children are engaged in stimulating science activities in many schools.

A second grade group of children developed a very rich science unit around miscellaneous questions about plants and machines. As exploratory thinking about their study was going on, a member of the class supplied the topic (or title) for their study by saying, "I know what it is we want to study: 'What makes things go and grow.'" And for many weeks the class studied plants and machines. Do plants need air? Do plants need water? Do plants need food? Do machines need food? What makes an automobile go? Their study had a real purpose because the questions studied were those of the children about plant growth and machines.

The curriculum guide in one school suggested a study of "sound and electricity" in science and of the "sense organs" in physiology. An ingenious class developed a study combining the two. Their topic question was: "How do we keep in touch with the world around us?"

The idea behind their investigation was to study each sense organ and then to explore how each sense is extended beyond the body. Thus they studied the ear, the ear-phone, telephone, radio, etc. They studied the eye, eyeglasses, telescopes, microscopes. They studied the sense of touch, scales, rulers, and ways of making accurate measurements.

This fifth grade developed and also limited their study by deciding what they and their teacher thought fifth graders needed to know to be well informed fifth graders on these topics.

A third grade class worked at a "research project" to answer the question, "How can we keep from being hurt by automobiles that pass our school?" This was stimulated because one of the children had been bumped by a passing car. They made a survey to find out where the children's parents let them out and picked them up. They learned which ones came by street car or bus. They learned it wasn't possible to have a restricted loading zone on the main street near the school building. They identified all the spots where children could load or unload without having to cross a street to get to the building.

They made maps showing these spots. They distributed the maps to all 300 children in the school to give to their parents. This was their best immediate solution to the problem.

I am convinced that the planning and activity that went into this learning situation helped build the kinds of skills which we hope children will encreasingly learn in school.

The next example will serve to illustrate a number of other good procedures and methods.

A combination first and second grade class was planning a school garden, and they raised some questions about plants: "What makes plants grow?" "What do we need to do in setting up our school garden?" "What do plants need to grow?" Almost all children can say that plants need air, water, sunlight, soil, and food. And these children supplied the correct answers. Even so, the teacher did not say, "Yes, that's right, plants need those things." If she had, there would not have been much learning involved. So, they decided to study each of the proposed answers in turn. First: Do plants need air? That's rather a tricky question for first and second graders to investigate. They decided to think about it until next day to see if they could figure out a way to learn whether plants need air.

The teacher was puzzled because she couldn't think of a way, and when they next came together no one had a proposal. Finally one youngster said, "Why don't we just pretend for a little while that plants *do* need air and then find out where they could get it *if* they need it?" That took the teacher off the hook. I was visiting the school and I saw her relax.

There are lots of ways for first and second graders to find out where air is. They began to think of places where air might be. They suggested many places including—all around us, up above, in the cupboard, in a hatbox; and finally one youngster said, "In a paper bag."

Again, I think this teacher demonstrated her skill as a good teacher when she said, "Let's see if we can find out if there is air in those places." They decided to find out the following day whether there was air in a paper bag. This sounds very simple, but it is the heart of the way you work with children in science. They planned that everyone who could would bring a paper bag. I visited them the next day too, and I thought, "If I'm going to be there with them I'd better figure out a way to find out if there's air in a paper bag; they might ask me." So I thought of a way which I could demonstrate.

The next day they came to school with giant grocery bags, popcorn bags, little candy bags, and hat bags. They had every kind of a bag imaginable. At class time they sat on the floor. They folded up the bags and sat on them until they were ready to use them. Then they began to figure out a way to see if there was air in those bags.

They made a half-dozen suggestions very quickly. You could put it over your head and hold it and see how it feels. You could put a bug in it and see what happens to the bug. You could pop it.

Then came this particularly thoughtful proposal. One youngster said, "You could hold it up and see if it moves, because we learned yesterday that air moves." They tried it. Each child held his bag over his head. It was a very warm day, and in the corner was a big fan, blowing vigorously. Soon the bags began to move back and forth, and the children's heads began to nod.

But about that time, when everyone was nodding, there was a little chap down behind the teacher's desk who said, "But my bag isn't moving, my bag isn't moving!"

There was no verbalization at this point; they were trying many things. The teacher asked if there was anything else they could try. One little girl said, "Well, you could open it up so that air could get inside, and hold it up to the face of someone nearby and squish it." So they did that. One smile after another broke out on the faces of the children as they felt something on their faces. There was really no need for talk now; everyone had had an experience.

This illustrates that if children have experiences which give them the idea of the things you are trying to learn, you don't have to verbalize it.

The lesson had ended and neither the teacher nor the children had asked me for

a suggestion, so I smuggled my experiment out!

WELCOME LANDMARKS IN SCIENCE TEACHING

In the several examples which I have described briefly, I believe we can find most of the essential characteristics of good science teaching, though no one episode includes all the characteristics. By looking at these heartening examples we can identify five observations which I believe describe "Where We Are in Elementary Science," our theme for today.

1. *We are becoming clearer in our understanding of why we teach science to children.*

Throughout our country there is general acceptance of two significant purposes as reflected in science programs. The first of these is stated in various ways: "To help children understand their environment." "To help children understand the world in which they live." "To help children understand their surroundings." These statements imply that we believe a study of the environment can yield knowledge about the world that is useful to children.

How do we know when knowledge is useful? One test of its usefulness is that it gives a basis for making sound and reliable predictions. Thus, we want children to gain knowledge about their world so that they may make wise predictions. Their behavior, choices, and decisions should reflect wise use of information.

Now to illustrate the importance of prediction in our lives I'll mention some common, everyday things. You hang your clothes out on the line. You predict that something will happen. The prediction could be wrong, but you believe the clothes on the line will dry out. When you get up in the morning and go to school you do not carry a flashlight. If the sun is not already up you believe it is going to be up. You predict that the sun will come up every morning, and it is a pretty sound prediction. It is based on knowledge. When the barometric pressure falls, you predict that the weather is going to change —perhaps it will be stormy or rainy—and this influences your behavior. You have learned that usually when the barometer pressure falls the weather will change. If you leave a silver spoon in egg batter, you make predictions about what will happen to the spoon so you don't leave it there very often. If you don't cover the aquarium when it has water in it, something may happen to the water. I can think of dozens and dozens of examples that show how behavior is based on predictions.

The second significant purpose which is rather universally accepted by those who teach science successfully to children has to do with learning how to learn. As children gain knowledge about their world they employ and learn skills which they can use more maturely in studying subsequent questions and in solving other problems. Children learn methods of inquiry which help them to go on learning without the teacher.

Thus in summary my first observation is that we are coming to know more clearly why we are teaching science—to enable children to gain useful knowledge about the world and develop ever maturing skills for learning.

2. *We are keeping in mind what we know about children and how they learn.*

The Forty-Sixth Yearbook of the National Society for the Study of Education dealt with teaching elementary science. One contributor * listed a number of characteristics of children which we must keep in mind as we work with them in the field of science. I should like to mention four of those characteristics, in a somewhat modified form.

(a) Children are investigators
(b) Children learn best through doing

* *Science Education in American Schools.* National Society for the Study of Education. Forty-Sixth Yearbook, Part I. P. 63.

(c) Children learn better when they understand the purpose for engaging in learning activities
(d) Children learn in different ways

It is my opinion that if teachers seriously and consistently take these characteristics into account there will be good science programs for children. Indeed, it might almost be argued that a teacher who seriously and consistently takes into account any *one* of these characteristics will have a good science program. Fortunately, no teacher need be limited to a consideration of only one of these characteristics.

But just think of the great potential if a teacher seriously took into account the first of the characteristics which I mentioned: Children are investigators. Children want to find out. They ask questions. They explore. They feel. They listen. They touch. They do all those things if they are given an opportunity.

Yet to say that children are investigators is a generalization. Perchance there are children in every classroom who are not investigators. Perchance there are children who have had their interest dulled, children who have lost their tendency to investigate. In such instances the teacher has a responsibility for giving children experiences of various kinds, for giving them interesting things to do, for providing materials that excite curiosity. In short, every teacher must try to re-create the powerful drive to investigate when it appears to be lost.

On the other hand, if children *are* interested in many things (and they usually are) teachers must nurture those interests and build on them.

The next characteristic of children is that they learn through doing. Recognition of this prinicple of learning gives the teacher a powerful tool in helping science teaching come to life.

What are some of the things we want children to learn? Here are a few illustrations: To become more observing; to learn to be speculative; to learn how to think critically; to learn how to plan together; to be able to make good judgments; to be creative.

If we believe these are things we want children to learn, then there must be opportunities for children *to do* them.

Children who have many opportunities to learn through doing are less apt to verbalize ideas without understanding them. Understanding of ideas is a basic goal. Verbalizing is a means of communicating understandings. If children continually verbalize without having concrete experiences, it is like building a pyramid upside down. It is top-heavy. It collapses. Children need to have a base in experience before ideas have meaning.

I think this is illustrated pretty well by a cartoon about "Nancy," which some of you doubtlessly read in the daily paper. Nancy came across the word "frustrate." She scratched her head and said, "Frustrate, I must look that up." So she looked it up and it said "to frustrate" means "to thwart." So she looked that up and it said "to thwart" means "to baffle." She looked that up and it said "to baffle" means "to foil." When she looked up "to foil" it said "to circumvent." So she looked that up, and what do you suppose it said? "Circumvent" means "to frustrate."

At what points and in what ways can we dig into these verbal circles and give real meaning to the words which children use? This is a major question for teachers of science.

Children learn better when they understand the purposes for engaging in a learning activity. Recognition of this characteristic was amply demonstrated in the illustrations I described earlier. The statement implies involving children in as many ways as possible in deciding what is to be learned and how it is to be learned. In teaching science, this involvement is simplified by developing plans around questions and interests of children.

Another thing we know about children is that they learn in different ways. An individual child studying any particular

question may need help from various kinds of learning resources. Though he may learn well by listening, he will probably learn more, for example, by listening and experimenting and seeing a film.

In a group of children, some learn better through engaging in an experiment, some learn better by taking a trip, some by reading, some by seeing a film. In a group-teaching situation we cannot rest assured that learning is at a maximum if we use only one learning resource. If children learn in a variety of ways and we settle time after time on just one approach, we're missing many of the children. As teachers see that helping children learn how to learn is an important part of teaching science they are relieved somewhat from the fear of teaching which comes from the mistaken thought that teaching science means transmitting catalogued knowledge from the head of the teacher or from books to the heads of children.

Thus far, I have attempted to say that in teaching elementary science today we are understanding our purposes better, there is much good science teaching, and we are, more and more, taking into account what is known about children and how they learn. We are putting more and more effort into helping children develop mature skills and methods for investigating questions.

3. *All children do not need to know the same things about the natural environment.*

We are recognizing both in curriculum planning and in teaching that all children do not need to know, and indeed cannot know, the same things about all aspects of the environment. The world and its wonders are too vast and complex for the greatest scientists to understand. They become specialists of smaller and smaller aspects of the total environment. Thus it is futile to assume that all elementary children should be taught the same thing about every aspect of the environment selected for study. This idea implies that we need to do careful planning to provide ways for children to get experiences that are suitable to them, though all do not need identical experiences.

In many cities, counties and states throughout the country science guides are being developed that are rich in suggestion for teachers and children. They include much more than any one child can experience and learn in school. Used wisely such guides enable teachers to plan science activities that advance the knowledge of classes and at the same time provide for the individual needs of children in the classes.

4. *Science is not a time.*

An important point, but one I shall mention only briefly, is that science is not a time. We have agreed that science is a process of investigation, a kind of inquiry, a way of finding out. In classrooms throughout our country where teachers look upon science as a process of investigation, children do not characterize science by any one limited description or procedure. For example when children see by the schedule that science is to come at 10:15, they do not automatically take out their "science" books. Nor do they automatically think, "Oh boy, time for experiments." Nor, "time for a field trip." Nor any other one limited approach to learning.

When children and teachers accept the idea that science is a process of investigation, and that many resources for learning are important to the process, then their behavior reflects this way of thinking about science. And what they do during "science time" they do because they have planned it that way and they believe what they are doing is the best procedure or combination of procedures available to investigate the study at hand.

5. *A shortage of science research, engineering, and teaching personnel raises*

questions about the role of science teaching in the elementary school.

We are now in a period when tremendous interest and some fear about the shortage of science personnel are causing many people to wonder what should be done in the elementary school. It is my belief that teachers who are guiding children in rich and varied experiences in science are thereby doing the most important single thing to stimulate and nurture interest in the science professions. I do not believe a rigid, superimposed curriculum in science for all children will automatically stimulate children to become scientists. Probably an important factor is the interest and enthusiasm of teachers for science. Thus schools need teachers who can keep alive the interest of children in science as well as in other areas of learning.

The schools have an opportunity and responsibility to help identify children with special aptitude or interest in science. Once identified, the problem is to keep this interest alive and at the same time to help children become educated in an all-round way.

Good elementary schools manage this by developing the science program as a part of the total program. In such schools there is a realization that what we do and how we work with children in science must contribute to the purposes of the total elementary school program.

SCIENCE FOR CHILDREN THROUGHOUT THE WORLD *

Willard J. Jacobson

Teachers College, Columbia University, New York, New York

We know very little about the nature of the experiences that children throughout the world have in science. Yet, we have much to learn from our friends throughout the world. The only excuse for my attempt to speak on this subject is to try to express, in an inadequate way, some of the things I've seen and learned during the past two years. Some of the things I've seen are simple but seem to be important; other observations are of complex matters that I do not pretend to understand and am inadequate to describe in as cogent a manner as I might wish.

During the past two years, I had a chance to work closely with teachers and children in Afghanistan and an opportunity to travel and observe in India, Pakistan, Iraq, Lebanon, Turkey, and a number of countries in Europe. In my preparation for these experiences, I gained a great deal from the examination of some of the limited number of studies available on science education in other countries. Some of these studies are listed at the end of this paper.

In this paper I will describe and explore three ideas that grew in significance for me as a result of my experiences in other lands. These ideas are not new to you nor were they new to me, but they have grown in significance and acquired new meanings for me during the last two years.

First, I gained a deeper understanding of the fundamental importance to children, teachers, and parents of the area of work, knowledge, and study we call science. Some things that we take for granted are critically, almost desperately, important to others. Second, I perceived new opportunities for flexibility in the development of science experiences for children. Sometimes we do not even see the barriers that prevent us from developing new and fresh ways of doing things. Third, to me it is clearer than ever that children's science

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experiences grow out of the immediate environment in which they live. Some may impose from without, but growth is from within.

CHILDREN, TEACHERS AND PARENTS RECOGNIZE THE IMPORTANCE OF SCIENCE

To many people, scientific information is of critical importance. Parents everywhere love their children. The information that will make it possible for their children to continue to live and grow is prized. In too many places in the world, food is in short supply. If the yield of rice can be doubled through the introduction of new strains, a precarious existence at the edge of the abyss of hunger is converted into a life of security. People are recognizing that the application of scientific information makes a difference. In fact, at times, there is a danger that science may be viewed as a panacea that will prevent or cure all ills.

Parents are Eager For Their Children to Have Science Experiences. In most places, the opportunity to be educated is a prized privilege. Men who have had no formal schooling often will make considerable sacrifices so that their sons can learn in schools other than the school of hard knocks. Many of the farmers and laborers with whom we talked had great faith in education. "Education is the key that unlocks the door to the future."

Many of these parents were especially concerned that their children have an education in which they would learn how to do things. Almost always, they wanted their children to learn how to read, write, do arithmetic calculations, and learn the main tenets of their religion. But, they also wanted their children to learn how to remain healthy, how to raise more rice on an acre of land, how to prevent sickness in farm animals and to learn a trade, occupation, or profession. In one village, when we discussed education with the elders, they added, "We would like our sons to learn something about electricity." However, we hadn't seen wires or any other signs of electricity in the village. Since electric power was not available in the village, we asked the elders why they were so concerned that their sons should learn something about electricity. They answered, "Some of our boys will leave our village and go to study and work in the city where there is electricity. But, of even greater importance to us, within two years we hope to have electricity in our village. We want some people in our village who understand electricity, what we can do with it, and the dangers that are involved in handling it." Elders want their children to learn how to do some of those things that will help improve conditions for living in villages and cities.

Children Are Eager to Understand and Interpret Their Environment. It is safe to say that people everywhere are more alike than they are different. We would expect children everywhere to be interested, concerned and involved in their environment, and they are. The children with whom we worked were eager to explore and interpret experiments, demonstrations and phenomena of their environment. Often, their background of experience is much different from ours. Sometimes, because they have had much different experiences, they develop interpretations and ask questions that might not occur to us. These novel interpretations and fresh questions often impelled us to take a new look at matters that we had too often taken for granted.

"Why are we still thirsty, sometimes, even when we drink so much water our stomachs swell?" Water is of critical importance. The presence or absence of water in an area determines whether or not it is possible to live there. In desert areas, of course, many children may have had the experience of becoming very thirsty. Wells and springs and streams are often widely separated. Even then, the water may be brackish and salty. A thirsty youngster would not allay his crav-

ing for water by drinking from such a source.

"When we strike two stones together we see sparks. Are these electrical sparks?" We had been doing some work with flashlight cells. We had held one end of a wire against the bottom of a cell and scratched the other end of the wire against the center contact on the top end of the cell. We saw sparks. The boys made similar sparks by striking one hard stone against another. Have you ever tried to find out the nature of sparks that are produced when two hard rocks are struck against each other? Is the spark that is produced an electrical spark?

"Why do some parts of the world have a great deal of rainfall while other parts have so little?" Without water, life cannot exist. In so many parts of the world water is a scarce and precious commodity. A man and his bullock or team of donkeys may have to work a long, hard day in order to lift enough water out of a well to irrigate a small plot of land. Often, this becomes a job for children. Yet, in school, these children read and hear of places where it rains often enough so that no irrigation is needed—where there is no need to compete with one's neighbor for a little water to soften parched lands. Why is it that in some parts of the world there is plenty of rain while in other regions there is so little.

"What are flying Saucers?" This question had a familiar ring, and we were rather startled to hear it. One spring, the newspapers and radio reported a number of sightings of flying saucers. Some of the children said that they had seen the saucers. "What were they?" We were skeptical to say the least. However, several times, I saw what must have been the phenomena that was reported as being a "flying saucer." In the evening huge flocks of birds could be seen flying about as if in a swarm. When they were miles away, the swarm sometimes appeared to be like a huge top spinning slowly across the evening sky. Sometimes the top seemed to flatten out; mix the observation with a little imagination and there would appear to be saucers hovering in the sky.

The children with whom we worked were eager to work with equipment and handle materials. As in other places, the science experiences that involved active participation and an opportunity to see and handle concrete materials seemed to be particularly successful. In most cases the materials that were used were materials that were available and used in the community. In the study of electricity, the flashlight is one of the most widely used electrical appliances. Teachers, using flashlights, help children to understand conductors and insulators, electrical circuits and switches, bulbs and reflectors. In several schools, the children became quite adept at "trouble-shooting" and repairing, defective flashlights. The teachers reported that the children enjoyed and profited from the opportunity to use their understanding of electricity in a practical, functional way.

Many Teachers Are Eager to Teach Science. Many sensitive teachers recognize the eagerness of children to understand and interpret their environment and see this as an opportunity to contribute to the development of the children with whom they work. Many teachers have seized whatever opportunities are offered them to develop proficiency and understanding in science. They participate in workshops, use articles published in educational journals, purchase from meager salaries materials for teaching science, and test out with their children new ideas for study and teaching in science.

Many teachers were particularly concerned with health education. The health education film *Why Infants Die* has been an educational film hit. In countries where there are few doctors, disease prevention acquires and deserves recognition as a bitter necessity. Disease prevention depends upon knowledge and care. A great deal of dysentery can be prevented if you

know that the bacilli of dysentery are often carried by flies and polluted water. Trachoma can be prevented if we know how to care for children's eyes. The disfiguring disease yaws has been eliminated from some sections of Southeast Asia by the application of scientific information about how the disease is transmitted. Teachers can and are eager to help children and their parents prevent disease. They realize that, if they can prevent one case of trachoma or check the spread of tuberculosis, they will have made a singularly significant contribution to the lives of the people in their village. In our experience, in-service courses and workshops that helped teachers to become better informed in the areas of disease prevention and health education were very popular with teachers.

As elsewhere, the teachers with whom we worked found it fruitful to approach reading and arithmetic through children's experiences in science. Experience charts developed from science experiences help provide reading materials that are directly related to the children's experiences. Records and accounts of experiments and projects are essential to success. Measurements and arithmetic calculations are needed to sub-divide school gardens into smaller plots. Science experiences provide a setting in which the value of certain skills becomes evident and this helps make some of the work and study in the elementary schools more meaningful for children.

GREATER FLEXIBILITY CAN BE ACHIEVED IN THE DEVELOPMENT OF SCIENCE EXPERIENCES

In some respects, we have a flexible approach to the development of science experiences for children. We have unequaled resources and facilities. These are of great value to us and our children. They enable us to do things with children that otherwise would be impossible.

From the perspective of work in another culture these resources and facilities sometimes appear to be the "chain that binds." Sometimes, our materials and resources serve as a limitation to innovation and adventure rather than as the basis for imaginative experimentation. Children elsewhere sometimes have opportunities for experiences that are not made available to our children.

Teachers in some parts of the world are able to develop science experiences without fear of damaging elaborate furniture and expensive floors. The furniture and facilities in our schools are the envy of many, but we, in turn, can envy the flexibility of approach that is possible when buildings, equipment and facilities are simply constructed out of local materials.

The most important building material in South Asia and North Africa is clay. Most homes and school buildings are made from clay dug from the ground just outside the building. The clay is mixed with water, molded and sun-dried into adobe brick. In India, we visited a school where an additional classroom was being built. It was a holiday. Yet, many of the children, some of the fathers and all of the teachers were hard at work. Some of the fathers were digging the clay out of the ground; the children were mixing the clay with water and molding the bricks; the teachers and some of the children were laying the hardened bricks into walls for the new classroom. Certainly, there must be important educational benefits derived by children from an experience such as this. How many of our children learn how to build a schoolhouse? How many of our children have a chance to work shoulder-to-shoulder with their fathers and teachers to build something that is needed in the community?

In many classrooms, children and teachers have made serviceable chalkboards by spreading a smooth surface of wet clay on the wall. (If the clay is mixed with a little cement, it makes an even better surface.) When the clay hardens, it is painted over with two or three coats of blackboard paint. When the chalkboard is chipped or pitted, it can be repaired by spreading

another thin coat of wet clay over the surface. These clay blackboards are not as smooth and durable as ours, but teachers and children can make them where and whenever they wish.

Children and teachers can make chalk out of gypsum and talc. A mold is made by boring a series of holes along a line that divides the block of wood into two equal halves. After the holes are bored, the block is sawed lengthwise along this line. The two halves can be hinged at one end so that the mold can be opened outward to remove the hardened chalk. The holes in the block of wood are greased; the gypsum and talc are mixed with water to make a syrupy fluid. The mold is placed on top of the clay, and both ends are sealed with clay. The syrupy gypsum-talc mixture is poured into the mold. When the mixture has dried, the mold can be opened and the chalk removed. In this way, a soft chalk can be made that is suited for use on the clay chalkboards. This soft chalk is also very porous. It can be used as a blotter when no other blotter is available.

Large outline maps are made by laying out lines of clay on the floor to represent the boundary lines of provinces or nations. Three dimensional maps are made of clay to show the general topography of a region. Children have made replicas of their village and its farm land out of clay. One class used such a map in their study of rocks and minerals. At the proper places on the replica of their village, they placed samples of the kinds of rocks that were found there. Actually, this is a very simple and useful way to classify rocks. These children learned how maps can be made and ways that materials can be classified. Local clay is a very useful material for teaching; in some cases teachers have shown great imagination in its use.

Stone or mud floors in classrooms do have some advantages. There need be no fear of spilling water or ink on shining floors. In many cases, soil is spread over a small section of the floor in which various plants can grow. I have seen small plots of green grass, ringed with flowers, growing on the floor of the classroom.

More often, children grow plants in plots in their school gardens. In regions where schools are open during the summer growing season, there is an excellent opportunity to use the school garden as an outdoor laboratory. These opportunities are being utilized with more and more imagination. Children plant different kinds of seeds to see which will give the greatest yield. "Will the seeds from America work as well as those that we have always used?" They try planting them at different depths; experiment with various methods of irrigation, and learn how to mix and apply insecticides to protect their crops. One group of youngsters had a financially profitable experience of raising silkworms on mulberry leaves grown in their garden. They were the first to become engaged in a practice that may become a new source of income for the people of that village.

Some youngsters have an opportunity to learn how to set up a controlled experiment. They have tested different kinds of seeds. They try to control all other factors such as quality of soil, methods of planting, and amount of water and sunlight. The only variable was the kind of seed planted. The results of their experiments were important. Perhaps, of greater importance is the opportunity that these youngsters had to gain an understanding of a significant method of research in science.

One teacher used the water that flowed in the irrigation ditches as an aid in his teaching of electricity. The analogy is an old one, but he used dams in the ditches to show how electrical switches work. "When a dam is placed across the ditch, the water won't flow. When a switch is open, the electric current won't flow. Open the dam; the water flows. Turn the switch, the electric current flows." He carried the analogy further to show how single-throw and double-throw switches work.

The necessity to rely on common, inexpensive, local materials has its compensations. These are the materials with which children are familiar. When these materials are used with imagination, they make possible greater depth for children's experiences in science and more flexibility in teaching. We can learn a great deal from our friends throughout the world about how to make the most of the materials around us.

CHILDREN'S EXPERIENCES IN SCIENCE GROW OUT OF THE ENVIRONMENT IN WHICH THEY LIVE

The UNESCO survey of science in the elementary school reveals a wide variety of approaches to the development of science experiences in the elementary school.[1] In Austria, science in the first three grades is a part of the study of the homeland (Heimatkunde). In New Zealand the children's experiences are classified as nature study in the lower classes and as elementary science of agriculture in the higher classes. In Afghanistan for the first three classes, science forms part of the introductory teaching on daily life. In the fourth, fifth, and sixth classes definite provisions are made for the study of science. We should not try to evaluate these various approaches. They can be evaluated best by the people who are working with the children in the environment in which they live.

It seems obvious that children's experiences in science should be developed in relationship to the environment in which they live. We understand and interpret our experiences in terms of our own past experiences. To most of us the term *karaiz* has little or no meaning. To many a youngster in a desert environment the karaiz is an underground system of irrigation by which water is provided that makes life possible in his village. We can understand what a *karaiz* is when it is described as a series of open wells connected by underground tunnels. We are able to understand it because we can relate it to something that we know. True, education should "expand horizons," but horizons are meaningless unless they are related to that which we know.

The questions and concerns of children have been formulated out of the experiences they have had in their environment. In my work elsewhere, I never had a child ask me how an elevator works. Also, the nature of the environment determines the kinds of experiences that can help us to achieve a better way of life. For most children in the northern part of the United States, a knowledge of how to prevent malaria will make little improvement in their health. However, a knowledge of how to prevent the common cold would be of considerable help.

The child who leads a nomadic or pastoral life is affected greatly by the natural environment. If there is an icy rain on the day that he is to shepherd his flock from one pasture to another, he will have a cold, miserable day. Disease may decimate his flock or ruin his vineyard. He will produce most of his own food, help build his own home and perhaps make the cloth for his own clothing. During much of the year, he may sleep outside to protect his animals or his crops. His drinking water is obtained either from a nearby stream or from a well that he has helped dig. He knows where the things that he needs come from. Often, he will have only limited contact with machines, motors and engines, that play such a large part in modern technology. His life is chiefly affected by the natural environment.

Compare his environment with that of the child who lives in one of our large metropolitan centers. Often, weather may make very little difference to our child of the city. If he has to go outdoors, he may have to wear different kinds of clothes if its raining, but, in the city, he may not even

[1] UNESCO. *Introduction to Natural Science in Primary Schools.* This report is based on information supplied to UNESCO by member states.

have to shovel the snow off the walks. Some children in our cities may go for weeks without having their feet touch soil. Often our youngsters have a very limited understanding of the sources of our basic necessities. "Milk comes from the bottle. Clothing and food come from the store and water from the faucet."

Our youngsters, however, have a great deal of experience with a variety of technological devices. They use many different kinds of motors and machines to clean our homes, open cans, and for play. These are the things they know. It seems logical that many of the science experiences we develop with our youngsters would be built on their experiences with this great variety of technological devices.

Of course, children should have an opportunity to become aware of and understand phenomena that are not common in their environment. The child who lives, works and plays on fields, deserts and mountains should become aware of the products of modern technology. The chances are that they will become more and more prominent features in his environment. The child of our industrial age who lives in cities, should know of farms and forests. Children of the city may seem to be far removed from this kind of environment, but they are still dependent upon it for many of their necessities of life. Some of us would maintain that there are benefits from experiences in this kind of environment of which they should not be deprived.

Science experiences should be developed out of the environment in which children live. The environment in which many of our children live is much different from that of children in many other parts of the world. If we are to develop meaningful and fruitful science experiences we must examine the particular environment in which our children live and learn. However, we can gain a great deal from a study of the experiments and experiences of teachers throughout the world. We build at home, but we should use bricks from everywhere.

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UNESCO. *Introduction to Natural Science in Primary Schools.*

N.A.R.S.T. MEETING

The 1958 N.A.R.S.T. meeting will be held at the Hotel Sherman, Chicago, Illinois, February 20–22. A joint meeting will be held with the National Council for Elementary Science on February 22.

Persons desiring to present research papers on some phase of teaching science or who know of persons who should be invited to present research papers, should contact the Program Chairman, Professor Thomas P. Morgan, Morgan State College, Baltimore, Maryland, or Clarence M. Pruitt, Secretary of N.A.R.S.T., University of Tampa, Tampa, Florida.

HERBERT CLARK HUBLER

As the 1955–56 President of the National Council for Elementary Science and a noted leader in the field of elementary science education, it is most appropriate that Dr. Herbert Clark Hubler be the recipient of the Seventh Science Education Recognition Award. Dr. Hubler was born in Portland, Oregon, July 26, 1910. His family moved to Longview, Washington, where his mother still resides. Here Clark had some experience in grading lumber in the world's largest lumber mill. During these early years he also worked as a carpenter.

Educational training includes a B.S. degree from Western Washington College of Education, Bellingham, Washington, 1937; M.A. 1946 and Ed.D. 1949, Teachers College, Columbia University. During summer sessions, Clark completed more than a year's work, mainly in Chemistry, at the University of Washington, Seattle, Washington. At Bellingham, Dr. Hubler was a student of Dr. Leona Sundquist, noted science teacher and N.A.R.S.T. member. During these early college and teaching years Dr. Hubler became interested in elementary science and went to Teachers College, Columbia University to work in elementary science under Professor Gerald S. Craig. During part of this time he served as Dr. Craig's assistant and as consultant in science in the Horace Mann-Lincoln School.

Professor Hubler's teaching experience began as a rural teaching principal at Elma, Washington, 1933–34. This was followed by: elementary teacher and department head, Aberdeen, Washington, 1934–37; junior high school (science and mathematics for five years), followed by elementary school for three years, Seattle, Washington, Public schools, 1937–45; science consultant, Horace Mann-Lincoln School, and Assistant in Science, Teachers College, Columbia University, 1945–47; Teachers College of Connecticut, New Britain, Connecticut (assistant professor of science and science supervisor of three practice schools of the college), 1947–49; Summer Sessions (Washington State College, Pullman, Washington; Bowling Green State University, Bowling Green, Ohio; Harvard University, Cambridge, Massachusetts; University of Delaware, Newark, Delaware; Bluefield State College, Bluefield, West Virginia); Wheelock College, Boston, Massachusetts since 1949 (science education and physical science). It is interesting that Dr. Hubler was issued one of the last life teaching certificates issued in the State of Washington. Dr. Hubler's teaching experience has been quite broad, including nursery school; all subjects in the elementary grades; science, mathematics, and physical education in junior high school; and science and education courses in colleges and graduate schools. At Wheelock College he teaches courses in science methods and physical science.

Dr. Hubler married Reta Allison in 1934. They have five children. The oldest, Keith, is an undergraduate education student at Northeastern University, Boston. Bonnie is a freshman at Wheelock College and is planning to be a teacher, Thomas and Rowena are in the Brookline, Massachusetts, Public Schools. Craig is a three-year old and looking forward to when he can be in Kindergarten. Mrs. Hubler is Principal and Sixth-Grade teacher at Center School in Brookline.

Membership in organizations are as follows: National Association for Research in Science Teaching; National Council for Elementary Science; National Science Teachers Association; American Association for the Advancement of Science; Science Teachers of New England; Association for the Education of Teachers in Science; Association for Supervisors and Curriculum Development; Association for Childhood Education International; National Education Association; and Progressive Education.

Dr. Hubler served as First Vice-President of the National Council for Elementary

Science 1954–55. Previously he was a member of the Board of Directors and Chairman of Publications Committee of the N.C.E.S. He was local chairman of the Arrangements Committee for the Boston meeting of both the N.C.E.S. and A.S.C.D. He has served as a member of the Editorial Committee for N.S.T.A.'s Elementary School Science Bulletin. He edited the May, 1956 Bulletin. He is a fellow in the American Association for the Advancement of Science and is listed in *American Men of Science*. Dr. Hubler has served as chairman of the Elementary Science Level Committee of N.A.R.S.T. and is now a member of the College Level Committee. He is now president of the Harvard Church Brotherhood, a religious group.

Hobbies include writing, music, photography, badminton, sports, and community activities. In connection with his hobbies it is interesting to note that almost all of the numerous photographs in his recent book *Working With Children in Science* were taken by Dr. Hubler. Judging from the fine quality and variety of these photographs one would have to conclude that Dr. Hubler is quite a photographer.

Dr. Hubler is the author of *Working With Children in Science* referred to above and reviewed in this issue of *Science Education*. It is published by Houghton Mifflin Company, Boston. It is the result of some ten years of preparation. The title of his doctoral study is *Science Materials for Elementary Schools*. Articles published in magazines include: "Teaching Materials for Elementary School Science," *Science Education*, October, 1950; "Start an Elementary Science Program and Watch It Grow," *The Science Teacher*, November, 1950; "Teaching Materials," *Metropolitan Detroit Science Review*, September, 1951; "A Suggested List of Science Supplies," *The Science Teacher*, April, 1952; "As the Twig Is Bent," *The Science Teacher*, October, 1953; "Resources for Growth in Science," *Childhood Education*, September, 1957.

Dr. Hubler's philosophy and viewpoints about education, science teaching, and elementary science teaching in particular, are best expressed in his recent book *Working With Children in Science*. He believes in integrating both the practical and the idealistic. A few quotations will best illustrate Dr. Hubler's philosophy.

Working with Children in Science is concerned with realities—with opportunities and problems that arise in actual teaching situations. It considers ways of getting a science program started, of answering children's questions, of conducting experiments, of improvising equipment.

Experience indicates that teachers prefer and find most useful the kind of assistance which fills an immediate need in their work. . . . The educational view point is in substantial agreement with that of the Forty-Sixth Year book of the National Society for the Study of Education.

Children are natural investigators . . . with great curiosity concerning whatever is real and vital to them. . . Children have persistent curiosity and even small children are capable of direct investigation.

No teacher should fear science or be anxious because questions may be asked that he cannot answer. . . When the teacher, like the scientist, accepts the viewpoint that no one knows all the answers, the fear will be gone.

First hand experience is essential. . . . A child's background is limited . . . Incidental and prearranged plans can be complementary . . . Planning should be thorough yet flexible . . . Potential interests may be more significant than those of the moment.

The methods used (in elementary science) should be those that get results . . . The only reasonable justification for any teaching method, old or new, is that it gets results, the kind of results acceptable in terms of the objectives. . . Whether or not a certain method works often depends upon how it is used, and hence what is best for one instructor may not be best for another.

Many elementary teachers and science education leaders are in agreement with Dr. Hubler's expressed philosophy and his insistence upon direct, real experiences in science. As one of the younger leaders in science education, Dr. Hubler has made most significant contributions to American science education. The omen is good for additional significant contributions in the future. So appropriately goes the Seventh Science Education Recognition Award to Dr. Herbert Clark Hubler.

CLARENCE M. PRUITT

ELEMENTARY SCIENCE, BACKGROUND FOR TODAY'S WORLD *

DONALD G. DECKER

Director of Instruction, Colorado State College, Greeley, Colorado

EACH century produces its great teachers and its great students. In different centuries different kinds of teachers and students need to be great. The twentieth century demands more professional teachers and serious students of science than any other century. The more we know, the more necessary this becomes. The making of a good teacher and good student begins in the elementary school. No teacher can really be significant without an understanding of elementary science because it is the background for today's world. No student can be a great student in high school or college without an understanding of elementary science because it is the background for today's world.

I would like to contrast for you two ways elementary science is taught. There are two kinds of teachers who teach science. They are the get-by teachers and the curiosity-driven teachers. By the description of the work of these teachers I hope to help us reaffirm our faith in the belief that elementary science can be an important background for learning to live in today's world.

A teacher or a student can perceive the world and his job as a "get-by" world. How little can I do to get by? The same is true with educational ideas. You can adopt the "get-by" value as an educational philosophy. "How little of the world can I see and get by in teaching science and still say I'm making science a vital part of children's living? How little can I do and accomplish that objective?" The following story illustrates the "get-by" philosophy of some teachers and the struggles of an administrator to get a science program in his school. Listen.

Mr. Best, principal of George Washington Elementary School, called his faculty meeting to order. "And now, it is so late," he said, "I am going to skip all but the important part of the meeting. I want to tell you about the National Science Teachers Convention. We want to send someone who not only can profit, but who can contribute also and perhaps next year we'll be asked to be on the program. Won't that be fine? This is a hard decision for me to make, for you are all excellent teachers. I've hit on a scheme. I've asked the children to help me. Next week they are keeping their little eyes and ears open. And on Friday I am going to meet the children in the auditorium and they are going to vote for the one who should go. We are going to discuss the science lessons of that week, discuss the teachers and then make up our minds who will contribute the most by reporting a week of science in our school." Mr. Best paused for the general acclaim he expected to receive.

Ethel Burke was the first to speak. "Are you serious?"

"Yes, Miss Burke. I am. I think it is democratic. It is a good opportunity to give the children a part in a school activity. They will know, even better than me, who should go. Democracy in action. That is my theme, you know, for our school. You're never too young to be democratic, are you, Miss Burke?"

Miss Burke did not answer out loud but she whispered to Helen Eastman, "No, but you are too old to have any sense sometimes. I never heard such a screwy idea in my life. Wait'll the girls get their teeth into this one on the way home."

Helen Eastman spoke up, ignoring Ethel's whispered comments. "I think that is fine, Mr. Best. We'll all have a

* Paper presented at the National Council for Elementary Science Meeting, St. Louis, Missouri, March 16, 1957.

chance. The children are basically honest. I'm glad to trust their judgement."

"Thank you, Miss Eastman," replied Mr. Best. "We stand adjourned."

The next week brought science to the George Washington Elementary School with a vengeance. Grace Marion, the first grade teacher, decided to unearth the science books she had put somewhere at the beginning of the year. She ran next door to Calrice's room.

"Calrice, Calrice," she called. "Where did I put those first grade science books they loaded on us the first of the year? I knew I'd never get to them. It's all I can do to get through the important things." "You gave them to me," Calrice said. "You told me they looked too hard and you didn't know any science anyway. Here they are."

"Thank goodness," said Grace. "I'd do anything to get to Chicago. Let me see one of those books. Oh, here's a story about spring. Is it spring, Calrice? I mean, scientifically. This is April. My, it's cold. I'm still wearing my winter coat. Does spring come in April? Or do I remember it was March? Wasn't there something about it in the paper awhile ago—a hedgehog and his shadow, if he sees it, it's spring. Oh, what was that, Calrice?"

"Grace, Grace," laughed Calrice. "Don't get hedgehogs and the scientists mixed up. They loathe each other. And don't get the equinoxes and the solstices mixed up with the spring of the year. Spring begins March 16. Or is that the Ides of March? Oh, I don't know, Grace. Teach something else. My heavens, I'm having a hard enough time finding something for my kids. What can second graders fathom about science, I'd like to know."

"Where are your books," asked Grace. "They didn't skip you, did they?"

"Oh, I gave them to the librarian. I don't have room in here. Don't even have room for the books I use. I kept the teacher's manual though, and I've found a dandy little experiment. You get a bottle of iodine and drop it on potatoes and you know if you have starch."

"Calrice," said Grace. "Anyone that's been dieting as long as you have doesn't need to drop iodine on potatoes to know if they contain starch. How would iodine tell you something you already know? Let's see that manual."

"There it is on page fifty-four. Read it yourself," instructed Calrice.

"Honey, this is a fourth grade manual. Mr. Best gave you the wrong one."

"So what," replied Calrice. "Still should work."

"But will the children be interested?" asked Grace.

"They better be if I go to all that trouble," said Calrice. "Well, why don't we go down and ask Helen. She's the only one that does anything with science. She can tell us about spring and potatoes if anyone can."

Cora Marsh was solving her own problems in relation to teaching elementary science. She was a methodical soul and had gone to the city library and found a little book called, *Easy Lessons in Science for the Very Young.* In the book she had found an experiment on room ventilation. It described how thermometers could be used to show that the air at the top of the room is warmer than the air at the bottom of the room. She had bought two thermometers at the dime store. She was now sitting in her room with the last of the problem to solve, how to get the thermometer to the top of the room. She hauled a chair over to the corner of the room, climbed on it, and braced herself against the bookcase. She reached up. That would never do. She could only reach about a foot above the blackboard. Then she got a brilliant idea. She found a thumb tack, poked it through the top of the thermometer and went back to the table. With her left foot on the table and the right one carefully placed on the chalk tray of the blackboard, she hoisted herself up, holding on to the bookcase with her free hand.

The inevitable happened. The door opened and a child yelled, "Miss March?"

Cora would have jumped, except for her precarious position. She did, however, do something more hazardous. In turning to look at the child, she shifted her weight to the foot on the chalk tray. A great cracking sound emanated from the region of the blackboard. The chalk tray split from its foundation and Cora Marsh found herself with one leg on the table and one leg between the table and the blackboard. It jostled, and considerably shook her, but she wasn't hurt.

"Billy," she said to the child who was standing open-mouthed in the doorway. "Help me. Just pull that table a little so I can get out of here."

The child rushed to rescue his teacher.

"You'll have to pull a little harder," said Cora.

"But you're on it and you're heavy." said Billy, as he tugged.

He screwed his face up to one gigantic effort and gave a jerk.

"Not so fast," screamed Cora, losing her balance as the table went away from under her and she came down heavily on her left foot. "Ouch, oh, I've turned my ankle. OUUUUU Oh OUUUUUU. Run get Miss Sloan across the hall. Mercy, what a time over an old thermometer," she muttered getting up as best she could.

Miss Sloan came in and helped her to a chair. "You sit here and I'll get my car," said Miss Sloan. "You want to get that soaking, or you'll never make it to Chicago."

"I'm not sure it's worth it," said Cora, "but hurry, it does ache."

"What did you want, Billy," she said in an irked voice.

Billy spoke up, "The janitor said he'd put that thermometer on the ceiling, Miss March, cause you might hurt yourself. You want him to?"

"My name, Billy," said Cora, "is Miss Marsh, Marsh, Marsh. And tell the janitor thanks, thanks much. I'd love to have him put it up before I kill myself."

Ethel Burke stood in front of her class in precisely the same spot that she had been standing for twenty years. "Today, children, we are going for a science walk." Ethel paused for little ohs and ahs she knew would be forthcoming. They came. Ethel was rather proud of her idea. No one else was taking a field trip. This would really give the children something to talk about when they discussed the Chicago trip. They would remember what they had seen. A hand went up. No one ever talked in Miss Burke's room without raising his hand.

"Yes, David?" Miss Burke said, with just the right questioning tone in her voice.

"What do you do on a science walk." asked David.

"I'll tell you," said Miss Burke. "Now listen carefully. We will line up in twos. March out of the room quietly. Where do you put your hands when we walk down the hall?"

Sam raised his hand and was called on. "Over our mouths," said Sam.

"That is right," said Miss Burke. "And what happens to the person who forgets?"

Sally said, "You have to sit in the hall during play period."

"I'm sorry, Sally," said Miss Burke with the appropriate sigh. You spoke without raising your hand. You won't be able to go on the nice science walk with us. We must remember to raise our hands before we speak."

"I won't do it again," cried Sally. "Please, Miss Burke. I've never been on a science walk."

"That is enough, Sally," said Miss Burke sternly. "A science walk is for children who know how to behave. You have talked back to me. Take your chair and sit in the hall during play period today."

"When we get outside," explained Ethel Burke, returning to the directions for the science walk, "we will go down the sidewalk to the light, wait for the green light, cross the street, and walk to the woods."

Miss Burke recognized Sam's hand. He asked, "What are we going to see?"

"We are going to look for things that are alive and things that are not alive," explained Miss Burke. "When we come back we will make a list of these things and talk about what we have seen. Ready now?"

The children lined up, all but Sally, who put her head down on her desk and sobbed. Miss Burke said, "Sally, come with me. I'll take you to Miss Betterly's room. She will let you sit there while we are gone. I'll tell her you have been acting like a second grader and perhaps she will think you should stay there, if you don't straighten up." The two left the room.

Miss Burke and her class marched out of the school and down the sidewalk. They waited for the light and walked across the street. They entered the woods. Miss Burke held up her hand and the children stopped. She turned and said, "I have a basket. You may each bring me one thing that is alive and one that is not alive for our collection at school. Now be careful. Stay near enough so you can hear me." With that Miss Burke sat down under the shade of a tree. The children scattered, running with delight, and looking at everything. As they found something for the basket they came back with hundreds of questions. "What is this? See what I found. Is this alive? Is this not alive? What kind of a leaf is this? Isn't this a pretty rock? Can I take two of these? What is this?

"Just a minute, just a minute," laughed Miss Burke. "We'll put these in the basket and take them to our room. Then we'll ask Miss Eastman to help us find out what they are. Perhaps we can find out about some of them by reading. I know a story in our book about living and non-living things."

"This will make a good lesson," thought Miss Burke. "A very good lesson. Materials from the field. Identified by an expert. Reading as an information activity. I must think up a problem though. I know I heard Mr. Best say something about problem solving is an essential activity of elementary science experiences. I wonder what in thunder he meant? Oh well, Helen will know."

Ethel looked at her watch. "Time to go," she called. "Time to go, children." They lined up in front of her. "My that was a pretty vine you were sitting on," said Sam.

"Yes, wasn't it," answered Miss Burke, giving the vine a momentary glance as she mentally counted her pupils. "I'll just pick a leaf and take it for my part of the collection."

After school she got Helen Eastman into the room and said, "Now, Helen, you'll have to pull me through this. Tell me what these things are."

Helen, a little weary of teaching science to so many teachers during the week, rapidly called off the objects. She stopped suddenly. "Who brought in this leaf?" she asked.

"Oh," laughed Ethel. "That's my contribution. I was sitting on that vine and took a leaf so I wouldn't come home empty handed."

"That's the last comfortable sit you'll have for awhile. That's poison ivy," said Helen.

"Poison Ivy," screamed Ethel. "Poison Ivy, all over my ——."

"Yes" said Helen. "I'm sorry, Ethel. Come on, I'll take you to the doctor.

"Oh, oh, oh," wailed Ethel. "There goes Chicago. This darn science. It isn't safe. It isn't safe. Whoever put science in the curriculum ought to have his neck wrung.

I am sure no one in this audience is a "get-by" teacher. I know that the Ethels of Education are not sitting before me. You are the Helens of Elementary Science.

In summary of this first section, I have tried to make these points:

Elementary science as background for today's world will not be achieved:

1. By storing science books on high closet shelves.
2. By giving them to the librarian to store.
3. By the sudden buying of a book to use for one science lesson.
4. By regimenting learning experiences of

children to your own narrow concept of that experience.
5. By scrambling to get a science lesson when you must have one.
6. By cooperating with administrators only when personal rewards are possible.
7. By depending on one teacher in a school to carry the science program and help you.

In contrast to the "get-by" philosophy are the teachers who combine their philosophical values with native psychological drives. Their values are easily achieved because they are not separate from their psychological functioning but an integral part of it. They have a curiosity-drive that increases their perception of today's world as a background for elementary science. That curiosity-drive helps make them great teachers who produce great students.

The deep significance of today's world is not found in starch and thermometers unless they are related to a great event that will affect children for years.

The significance is found in an organized K-12 science program that is flexible enough to allow the study of important science events. Such an event is the International Geophysical Year, known as "IGY."

This part of the speech is a report of the work of a group of teachers to get ready for the IGY year. The teachers were curious and what they did during their regular on-the-job duties can be done by other teachers who have a curiosity-drive instead of a get-by philosophy.

An event as important as the IGY year should not be neglected at any grade level next year. When you leave this convention and are asked what you learned that is practical and useful for your school, you can tell about a plan to prepare for the teaching of concepts important to an understanding of IGY.

This kind of study is the desirable contribution of elementary science to an understanding of today's world. The newspapers, magazines, radio, and television are going to be full of reports on this year. The earth satellite is going to be launched. The teaching of elementary science for the understanding of the significance of this year demands background and planning. Good teachers will get ready for it. You cannot do it incidentally and also significantly. You cannot with incidental planning incorporate into the learning experiences of children the desirable and necessary relationships that exist among the development of concepts, problem-solving skills, and scientific attitudes. They must be carefully planned if experiences are to make possible the material achievement of all three simultaneously.

Both the development of skills of problem solving and the development of scientific attitudes must go hand in hand with the development of science concepts. Problem solving is the method that governs the organization of learning experiences during which children develop useful science concepts. It distinguishes true science from all other subjects even in kindergarten. Scientific attitudes are the beliefs that govern the acceptance or rejection of ideas learned during experiences. The science concept is the idea that spearheads the possibility of new experiences and makes learning a cumulative process.

If these objectives are achieved, the experiences of children must be planned with all the knowledge we have accumulated about learning. The selection and direction of experiences determines the amount of educational force the elementary science program will have as a background for today's world.

Such an event as the IGY is a "natural" for the accomplishment of these objectives as an added part of the planned curriculum. You have many chances to achieve these objectives in your regular program. Don't miss the excellent opportunity to add significant current events to your program that will speed up and re-emphasize and make possible the application of these objectives in a new situation.

"How do I do it? How do I do it?"

the teacher asks. Let me show you how some teachers did.

These teachers represented grades K-12. They wrote their own teacher's manual for next year. They selected questions to answer for their own information.

1. What is the International Geophysical Year?
2. When is the IGY?
3. Who is taking part?
4. What is the purpose of the IGY?

With this background the teacher can then start answering the questions about the teaching of IGY. These are the questions he needs to answer.

1. What science concepts do students need to understand to explain the IGY?
2. What experiences will help students develop these concepts?

Each teacher collected the charts, pictures, diagrams, and other materials needed. These are some of the sources:

(1) *Weekly Reader*
(2) *Science textbooks*
(3) *Life Magazine*
(4) *References books*
(5) *Look Magazine*
(6) General Electric pamphlets
(7) Bank displays of current pictures
(8) Original charts and diagrams
(9) *Current Science and Aviation*
(10) *Arizona Highways*
(11) Newspapers
(12) *Scientific American*
(13) *National Geographic*
(14) *Time Magazine*
(15) *Science Digest*
(16) *National Academy of Science*
(17) *Newsweek*
(18) *National Bureau of Standards*
(19) *Scientific Monthly*
(20) *Colliers*
(21) *Science News Letter*
(22) *Physics Today*
(23) *Natural History*
(24) *Science*
(25) *National Aviation Education Council*
(26) *High Altitude Sense*

Each teacher organized the learning experience into a problem-solving activity of three parts: Reading and seeing; doing and learning; testing and applying.

With this type of current event present next year, we achieve another significant value in the world today. The nature of science and the IGY is such that cooperation of nations is evident, the inseparable ties of science and social science are evident. The foolishness of trying to study these separately might become apparent. For they, to me, are like matter-energy—different forms of the same thing. They should be the nucleus of our core problems.

We cannot neglect the opportunity to witness the operation of desirable attitudes in the world, both social and scientific. Nor can we neglect the opportunity to make elementary science truly the background for today's world. We need to help others drop the just-get-by philosophy and join us in our curiosity drives. This will not take place unless those who have an interest and experience in teaching elementary science reach out their hands and help those who feel insecure, inexperienced, new to the profession. Let us share what we can do and offer our services to those who will have them. Through the operation of the human quality of service above self for science education, we can make elementary science, background for today's world, a reality.

DINOSAURS—THEN THERE WERE NONE *

MERVIN E. OAKES
Queens College, Flushing, New York

JIMMY and Amy were walking with their Uncle John along the seashore. Uncle John had promised to take them on a treasure hunt and now they were beginning the hunt.

"What are we looking for Uncle John," Jimmy asked, "Is it pirates' gold?"

"No," said Uncle John, "What we are looking for was here long before pirates' gold."

"Is it sunken treasure that has washed ashore?" asked Amy, "Are we looking for a ship's treasure?"

"No," answered Uncle John, "What we are looking for was here long before the first ship was built."

"Is it heavy, Uncle John?" asked Jimmy.

"It is not heavy now, but once it was heavier than a dozen elephants." Uncle John told them.

"What could be heavier than a dozen elephants!" exclaimed Jimmy.

"I can't think of anything," Amy said.

"Please, please tell us, Uncle John," both children asked as they jumped around him.

"What we are looking for are fossils." Uncle John told them.

"Fossils, what are fossils?" asked Amy.

"I know, fossils are bones of animals that lived long ago." Jimmy said.

"That's right," smiled Uncle John, "Fossils are bones of animals and they can also be the remains of plants."

"Where can we find fossils?" asked Amy.

"We can find them buried in the earth, or even inside rocks, like this one." And he picked up a rock. "You see if you leave a footprint in the sand and it is wet, and if it were to dry up into mud, after many thousands of years that mud would become a rock, and the rock would have your footprint in it. We can read rocks and they can tell us a wonderful story."

"Oh, Uncle John, please tell us." Both children crowded nearer to him.

"Let's sit on this rock and let me see if we can read this rock. You know, many people study fossils to find out what kind of world this once was. The study of fossils is called Paleontology, which means "the science of ancient living things," Uncle John told them.

"Please tell us about the animals bigger than a dozen elephants, Uncle John," Jimmy asked.

"Yes, please, please" begged Amy.

"All right," said Uncle John and he began the story. "Many years ago—long before history was ever written, long before there were any people on this earth, the Dinosaurs ruled the world. There were many different kinds of Dinosaurs; some were heavier than a dozen elephants, had long snake-like necks, small heads, and twenty-foot tails. They walked on their hind legs and stood as tall as a palm tree. Their small arms ended in clutching hands and curved claws longer than those of the biggest bear. Their mouths were as deep as a dark cave, and they had great dagger-like teeth. Others were pot-bellied, with faces drawn out and flattened, with 2,000 small teeth in their mouths. Some were short legged and square bodied, big as a truck with long horns over an ugly hooked face. Then, others were as small as our rabbits. But all of them were Dinosaurs, which means terrible lizard. They are related to our crocodiles, snakes and lizards of today. The land on which they lived was very different from our land today. There were low lands and swamps stretching across all the world. There were no mountains and the climate was the same everywhere. We know this because the

* Four Student Teachers, Marilyn Kihlgren, Helen Lessin, Joyce Martinez, and Sara Witkin, at Queens College, Flushing, New York, prepared and presented a science project. This project was in the form of a book as a third grade class might have prepared it. Along with the story, puppets were made and a play was presented.

marks of leaves and wood inside the rocks tell us what the trees and flowers were like. We know that it was very warm and in some places very dry, like a desert."

Jimmy said—"Gee Amy, those Dinosaurs must have been as big as that wave."

"What wave Jimmy? asked Amy.

"Oh Amy, you're right, look—"And both Amy and Jimmy looked around them. The beach was gone and in its place was a flat, low land and they were standing at the edge of a swamp. Then they saw the creature; he was huge with a little head, and he said:

"Hello there Jimmy and Amy—Let me introduce myself. I'm a dinosaur, a Brontosaurus by name, but you can call me Bronto for short. Dinosaur is the name they give to all types of terrible lizards, but Brontosaurus is the name they give to me, because I'm the Thunder Lizard. Before I begin to tell you of myself, allow me to describe a little of the animal and plant life which existed before I appeared on this earth. My relatives say that at one time all the animals and plants lived in the ocean and that all the lands were bare. Nevertheless, these same animals and plants were struggling to make themselves over for life on land. They even grew lungs to breathe air and changed their fins to legs.

When a 100 million years passed, the earth was dressed up in green plants. The first forests were filled with amphibians, who were animals that spent most of their lives on land, but laid their eggs in the water. It was from one of these kinds of amphibians that the first of the reptiles appeared. The reptiles not only lived on land, but they also laid their eggs on land too.

When the weather became colder and drier, the amphibians were not able to survive and the reptiles became more numerous and finally ruled the land. The reptiles were two legged cretures with small hands. Come to think of it, I'm even a more advanced reptile because I have four legs and use all of them to travel about.

The most famous dinosaur in this early period, called the Triassic period, was the Ornitholestes. They were midgets compared to me, yet they had long fingered hands. Their diet consisted of birds and dinosaur eggs. Now we come to the early Jurassic period where the Allosaur and I, the Thunder Lizard, and my relatives inhabit these lands. We are called Thunder Lizards because when we walk the land shakes. Very reluctantly, I say that the Allosaur is known here as the lord of the uplands. Ally, the Allosaur, is a very mean creature because his diet consists of smaller dinosaurs and me, that is, when he can catch me. You see I live mostly in the swamps and when I see him coming I run for the middle of the swamps where he can't reach me.

It's about time I told you of myself. As you can see, I have a long, snake-like neck with a small head attached at the end of it. I'm 16 feet high and 67 feet long. I'm six times heavier than the elephant, which makes me at least 40 tons in weight, but my brain weighs only a pound. But I think I have two brains—one in my head and the other in the middle of my back to help me move my hind legs and tail. This brain is twenty times bigger than my real brain. A stupid creature am I, but I lead such a restful and relaxing life. I sleep in the swamp with my nostrils above the water, that is when I'm not eating. You know—I don't even have to get up to eat my food because the weeds on which I feed float on the water. All I have to do is to stretch my long neck and suck the weeds through my teeth. I don't even have to chew my food. The stones that I swallow grind the food in my stomach. The only time I go onto dry land is to lay my eggs. I'm really a very meek and harmless creature who likes to mind my own business. Due to the fact that my stupid friends have fallen easy prey to the Allosaurus, I'm afraid that my family of Brontosaurii will become nonexistent upon this earth and Allosaur will become more vicious in their nature.

In fact, I've heard tell of the most terri-

ble of all the dinosaurs, the Tyrannosaurus. I think I hear him now." And the Brontosaurus disappeared into the swampy waters.

Jimmy and Amy looked up expecting to see a most vicious creature, instead they saw a little dinosaur on whose head there seemed to be glasses.

"Yes, the largest flesh-eating dinosaur known is the Tyrannosaurus rex," a squeaky voice came from the dinosaur. "The tyrant lizard—and would you believe it? I'm one. Oh, I know I don't look or act so mean as my relatives do; that is why they call me the 'Timid Tyrannosaurus.' You see, the tyrant lizard is 50 feet long and stands 20 feet high; the head alone is five feet long. My relatives go around eating everything up, especially the water-dwelling, duck-billed dinosaur. We rule the earth in the second period of the reptiles, the Jurassic Period. Anyway, they first started to call me the timid Tyrannosaurus when I didn't act exactly like my fierce brothers and sisters. I just liked to browze around the countryside looking down into deep lakes, or skywards to see what I could see. But it seemed that they wouldn't let me lead this peaceful life I preferred. Should you make fun of a person because he doesn't do what everyone else does? I don't think so. Any way, they forced me to go away and now I wander over this vast earth trying to warn all the dinosaurs that our age will soon be over. They don't believe me, but I can tell. Because of my bloody relatives, lizards grew things on their bodies to protect themselves like this armor covered Triceratops who is coming your way now—Bye."

"Well, he's really no friend of mine," said Triceratops, as he approached Jimmy and Amy. "For he eats meat and that means me—if he gets a chance. I eat only plants; they are so good for me. I'm Triceratops, which means three-horned lizard. My home is along the marshes of the great inland seas west of the Rocky Mountains, where Kansas and Nebraska are now.

Don't I look just awful? Well, there is a reason for that. You see, I am not very smart, in fact I am really stupid and very big and heavy. Why, I'm 26 feet long and almost ten feet tall, just like a story of an apartment building. Therefore, I can't run very fast, so I have to stay and fight; my ugliness helps, because no one wants to fight me. I look so scary that only the big Tyrannosaur would dare fight me. When I have to fight, these three horns of mine help, for I have strong muscles in my legs. When I push up, I can usually knock down even a Tyrannosaur. This beak of mine is very strong and protects my jaws and little teeth. And do you see my collar? Well it acts as a shield to protect my back and neck.

Perhaps it is because I have such protection and three horns that I have lived so long. For I am living in the Cretaceous Period and I think I will be the very last of the dinosaurs. No one really knows why dinosaurs are disappearing. I think they are just eating each other up. Also, our land is swelling up and just pushing back our waters. Maybe soon we won't have near enough water or food. It is not very warm any more, and since our scaly, hard skins are just made for warmth, we can't get used to this coldness. I noticed just the other day some strange little animals, all covered with hair. They move so quickly, not at all like us. Perhaps they are the ones who have been stealing our eggs. Yes, we're really disappearing, after me then there will be none."

"Amy, Jimmy, wake up," called Uncle John.

"We weren't sleeping Uncle John, we went to visit the dinosaurs and met Mr. Bronto, the Timid Tyrannosaurus, and Mr. Triceratops," told Jimmy and Amy. And in the far distance came a song:

First came the Brontosaur
More were to come
Next came the Tyrannosaur
Then there were some
Last came Triceratops
Then there were none

SIFTING FACT FROM FICTION IN SPACE TRAVEL *

JOHN STERNIG
Glencoe Public Schools, Glencoe, Illinois

NOT too long ago the space theme was all the rage on TV. Children's TV shows featured space jockeys who were able to do all kinds of wonderful things.

A child watching some such shows got the idea that a rocket trip in space was not much different than an airplane trip in our air. It took no special equipment except for fancy space uniforms; the take-off was not much different than a plane take-off. During the journey the travelers experienced few sensations they would not experience on an air trip. Life went on quite normally and the journeys were remarkably short. The farthest planets and even distant stars were easily reached in a matter of hours, it seemed. Adventures on distant planets were dramatic but not much different in essence than those in earthly jungles or deserts or arctic wastes.

The whole impression which was conveyed to the viewer was that there were no new conditions, that the story took place under reasonably earth-like surroundings with only an occasional exotic circumstance to provide a change of pace.

To be sure, these programs were not intended to be factually accurate. They were stories with a space setting and the adventure was the thing. But everything a child sees or hears or does is educational, whether it means to be or not. The youngster watching such TV shows gained impressions which were erroneous as he watched the story unfold. Space travel *is* different from air travel, not just in a matter of degree but actually of kind. Many children who accept science fiction gain impressions which are fundamentally wrong. They grow up with expectations which make scientific reality mighty tame and uninteresting. They expect far more of space travel than science or technology will be able to deliver in the immediate future.

Walt Disney in his Disneyland series has done us a real service by introducing a new concept—"Science Factual" as contrasted to "Science Fictional." Yet it is a measure of adult lack of readiness for the space age to see how they consider his science factual to be fantastic and unbelievable.

Adults who have contact with children, especially parents and teachers, have a real responsibility to know how to sift the fact from the fiction in this area and to be able to guide children in a scientifically sound understanding of developments leading to space travel in our time. How do we do this? By becoming informed ourselves! There is no substitute for knowledge.

How does one become informed in a subject which has not yet appeared in many textbooks? Current materials are the best sources of information. The daily papers and periodicals regularly carry stories about rockets, guided missiles, the satellite program and related topics. Become alert to them. Clip them. Organize them in some way to become a chronological collection of current developments. Magazines like *Popular Science* and *Popular Mechanics* regularly feature articles on this subject. So do magazines like *Science Newsletter, Scientific Monthly, Scientific American, National Geographic.* Then there are specialized magazines like *Sky* and *Telescope, Missiles and Rockets,* journals of the various rocket societies and the new publication *Spaceflight,* a journal of the British Interplanetary society. Even laymen's magazines like *Time, Newsweek* and *Reader's Digest* carry articles dealing with space travel. The bookstores and libraries carry scores of new books on the

* Paper presented at the National Council for Elementary Science Meeting, St. Louis, Missouri, March 16, 1957.

subject for all ages and interests. The radio, TV and movies feature it regularly in newscasts and special features. It has literally become a part of the current scene and needs only to be noticed. A few weeks of intensive reading will give any intelligent adult the basis for understanding what is science factual and what is science fictional.

Let us now consider some of the basic developments whch point the way to space travel before the close of this century.

How can man hope to travel in space, free from the earth's gravitational chains? Obviously not with aircraft. These depend on air both for lift and for motor function. Only a rocket can hope to travel in space. It contains in its fuel chambers both fuel for burning and the oxygen needed for combustion. A rocket is driven by reaction, not by the action of its exhaust gases as many people still think. Since the reaction force is exerted inside the craft it propels in a direction opposite to the exhaust and independently of the medium in which the craft operates. This makes it possible for a rocket to operate perfectly in space where there is no air to impede the free flow of exhaust gases and the consequent reaction is exerted with full force. See Figure 1.

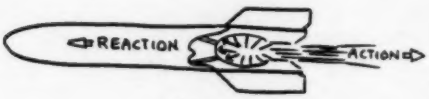


FIGURE 1.

The next point to consider is release from earth's gravitational attraction. This can be achieved in two ways, both determined by the use of energy to achieve speed. The first is orbital speed, a speed fast enough to place an object in an orbit, revolving around the earth. This speed varies with distance. Fairly close to the earth it is about 5 miles per second or 18,000 M.P.H. The second is speed of release which frees an object from earth's hold. This speed is 7 miles per second or 25,000 M.P.H. These speeds do not eliminate gravity, they simply overcome or balance it. Gravity extends into space from earth and other objects to an infinite distance. It never actually ends as some think. Space does not permit elaboration of these ideas so Figure 2 will have to suffice.

FIGURE 2.

Now we must consider whether any rockets now in existence can attain these speeds. There is no single craft capable of doing it, but multiple stage rockets are being constructed which will reach orbital speed. These are part of the Vanguard project which is designed to place a series of artificial satellites into orbits around the earth during the International Geophysical Year which began July 1, 1957 and ends December 31, 1958.

A multistage rocket operates on the booster principle. The whole assembly is lifted from earth by the motors in stage one. As its fuel is exhausted stage one is detached and the motors of stage two begin their work. When stage two is burnt out it drops and stage three takes over. In this way the last stage reaches far higher speeds and altitude than a single stage rocket could possible do. See Figure 3.

Again space forbids any detail about the earth satellite but information is easily available in the sources previously listed and the press will cover the project fully as the time for its realization comes. Even at this writing reports from the St. Patrick air force base indicate test firings of the rocket components are in progress. The

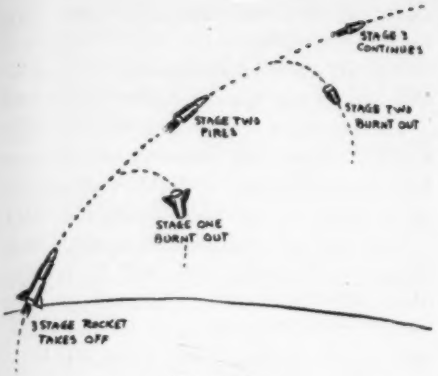


Figure 3.

contracts for the construction of the satellite have also been let. So it is only a matter of time before man's first real step into space becomes a reality although it will not be a big thing by science fiction standards. The satellites will be small spheres about the size of basketballs, weighing 20 to 30 pounds and packed full of electronic gear and instruments which will radio data to the earth, 300 to 800 miles below.

What comes next? The future can hardly be more than informed speculation based on known facts and plans. There is reason to believe that if the satellite program succeeds and if the data about outer space so obtained is satisfactory, the next step may well be the building of a manned earth satellite. Such a proposed satellite has come to be known as a space station and estimates for its realization range from 10 to 25 years. Such a space station would be constructed from pre-fabricated parts brought to orbit by huge, multi-stage rockets. The usual figures given for this project indicate a doughnut shaped device about 250 feet in diameter circling the earth at an altitude of about 1,000 miles and a speed of about 5 miles per second. All the conditions needed for life within would have to be provided and maintained.

The space station has several purposes. Some relate to scientific studies of space and observations of earth. One purpose deals with the next step into space, a journey beyond the earth, to the moon and then the nearby planets. Here the station serves as a booster for the deep space ship. Since the station travels in orbit at 5 miles a second a space ship on it would share this speed. Thus in order to reach speed of release it would need to use its motors to provide only an additional 2 miles per second.

At this point some further speculation is perhaps appropriate since it can be based on known facts. Scientists have worked out all the figures needed for a journey to the moon and the nearby planets. Dr. Werner Von Braun who is currently working on the United States Guided Missile Program has calculated that a journey to the moon would take about 10 days and one to Mars about 260 days. Von Braun's figures assume a rocket coasting in free fall. He describes these trips in great fascinating detail in two books—*Conquest of the Moon and Exploration of Mars.* While such books cannot be considered as final evidence, they do provide a basis for some educated speculation. The current issues of *Missiles and Rockets* magazine also carry reports that our air force is actively interested in a rocket to the moon to be fired directly from earth.

In spite of all this it becomes obvious that the fantastic adventures of the science fiction space traveler are not likely to come in our time even if space journeys to the nearby moon and planets do become a reality as many believe they will.

Teachers could well have some functional arithmetic dealing with space travel which would help children realize the problems of time and distance. For example, using the figure for speed of release (7 M.P.S.) and assuming continuous acceleration, we get a dramatic idea of time and distance through simple arithmetic. Have children look up the distances to the moon, planets and nearest star. Divide these by 7 miles per second and covert to hours, days, or years. Then chart the data as shown in Figure 4. The limits imposed on space

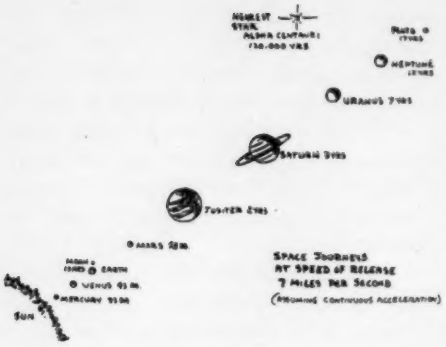


FIGURE 4.

travel by time and distance become dramatically obvious.

And yet even with these limits it is probably safe to say that the Columbus of 1992 is already born—that space travel will be a reality before the close of the century. The space explorer of 1992 is already in some home on this earth. On the 500th anniversary of Columbus' famous earth journey some space crew will be heading for a real New World. This is the thought we might well keep in mind for our teaching in 1957 as we sift fact from fiction.

MAKING THE MOST OF DEMONSTRATIONS IN ELEMENTARY SCIENCE *

EVAN C. RICHARDSON
State Teachers College, Newark, New Jersey

RECENTLY a kindergarten class presented an assembly program for the other children in the primary grades. It was in the late Fall and the theme of the entertainment was that of the seasonal phenomenon of seed dispersal. The teacher presented a script describing the discoveries which the children had made of the devious methods used by varied plants for delivering their seeds to new locations. To illustrate the various methods, each child, appropriately costumed to resemble a great enlargement of some particular fruit, presented a brief interpretive dance to show the mechanics involved. The fat little round "salt-shaker" of the Poppy blew his top intermittently to scatter seeds around, the sail-plane of the Linden whirled and twirled across the stage and came to rest at a point remote from its origin on a paper tree. Similarly, the Stick-Me-Tight, the explosion of the Witch Hazel's nut, the Devil's Pitchfork, and many others were all illustrated. This activity represented culmination for an area of observation, answer-seeking, and play. It is suggested here as a means of making demonstrations contribute worthily to the elementary curriculum.

Citation of this example is used to illustrate some of the premises upon which this thesis is based. The accent is on laws by which learning is believed to take place. It accounted for the principle of individual differences, it represented problem-solving with an opportunity for each child to contribute, to observe carefully about the "how," to think about and find a way of solving the problem of imitating a natural phenomenon, it related to several fields of experience, and it appealed to the imagination and resourcefulness of the children.

This example of a demonstration is far different from a *traditional meaning of demonstration.* A generation or so ago, and even today, demonstrations were presumed by many people to be experiments done by the status leader as an educative experience for the pupils. While there are many opportunities for this sort of performance in the elementary classroom program, the opinion here expressed is that a great deal more learning is likely to result

* Paper presented at the National Council for Elementary Science Meeting, Washington, D. C., April 7, 1956.

as this concept is broadened considerably. The material subsequently presented under the title: *Criteria to Determine Appropriateness of Certain Demonstration or Experiment Activities in the Elementary Classroom Program*, should adequately indicate the sorts of specific opportunities for the demonstration or experiment activities to contribute worthily to the curriculum.

Criteria to Determine Appropriateness of Certain Demonstration or Experiment Activities in the Elementary Classroom Program

I. Concerning very generalized criteria relative to most such activities:
   A. Are most of these activities "performed" by class members as individuals, or as members of a cooperating group?
   B. Is the classroom "climate" one which encourages close observation, or the repetition again and again, if desired, by each of the pupils?
   C. Are these activities done for the purpose of solving some problem pertinent to the area of major concern?
   D. In most of these activities does the teacher often refrain from providing direct answers to the questions and conjectures of the pupils?
   E. Are the activities of sufficient variety as to make possible practical involvement for each of the pupils?
   F. Are the demonstrations and experiments structured with materials that are simple, commonplace, and readily available?
   G. When many of the demonstrations or experiments "fail" to perform according to preconceived notions, does the failure provide the impetus which causes a continued study designed to reveal the causative facts? In such cases, is it pointed out that experiments never fail, that rather, our preconceived notions are often wrong?

II. Concerning activities which aim specifically at the development of scientific attributes of mind, are these things done so that pupils will be encouraged:
   A. To learn to distinguish between fiction and fact?
   B. To learn to distinguish between opinion and fact?
   C. To find answers from nature rather than from authority or preconceived notions? (In this connection, "nature" is intended to mean the physical as well as the living world, and authority is intended to mean the teacher or books.)
   D. To develop "openmindedness" that accepts criticism of one's own view, that searches for more plausible explanations than that held, and that welcomes new evidence?
   E. To delay decision until sufficient data or evidence is made available?
   F. To develop appreciation in the pupils of the difficulties involved in finding "new" facts, to pay tribute to those of their peers who have a gift of discovering valid explanations, and to pay tribute to the names of outstanding people who have made significant contributions to man's storehouse of knowledge?

III. Concerning activities which aim specifically at the development of understanding of the importance, and skill in the use of various facets of the scientific method as a means of finding facts, are these things done so that pupils will be helped:
   A To state the problem?
   B. To develop resourcefulness to propose means of solving the problem?
   C. To understand the need for careful planning with reference to a proposal which might lead to a solution of the problem?
   D. To understand the need for introducing the experiment-control element wherever practical?
   E. To understand the need for some form of record-keeping of the observations made during the progress of the activity?
   F. To have practice in attempting to assess the results of the activities, that is to evaluate the evidence in terms of what we have discovered?
   G. To understand some practical application of the discoveries?

IV. Concerning criteria relative to less usual types of activities:
   A. Are the activities varied to the extent that some resource person helps out in the classroom? Examples are of the pupil who has a special competency, or of the teacher of some other class, a parent, some lay or professional person not connected with the school, or some representative of business or government agency, any of who might provide "resource" assistance.
   B. Are the demonstrations or experimental activities occasionally carried on in some place other than the classroom?
   C. Do some of these activities relate to a broader base than that of the classroom? Examples here are: the Assembly Program, a Hall Exhibit, a local Science Fair, the maintainance of a show case, a special-interest club, the Museum.

V. Concerning the demonstrations or experiments "performed" by the teacher as an experience for the pupils, do her purposes relate to the fact that:
   A. Certain experiences have a mechanical

or comprehension base beyond the developed capacity and muscular skills of the pupils?

B. Such occasions may often provide motive in the extension of an area of concern, or of motive for the beginning of a new and different area of concern?

C. Such activities may be used as a means of a review or challenge.

D. Such activities may be unusually potent as a possible way of evaluating behaviors, growth in understanding of the scientific methods, and growth in the development of scientific attributes of mind? (It may well be that these last two suggestions would be among the most important areas to investigate as potential for a means of measure of pupil growth in the intangibles of appreciations, understandings, and growth in attitudes, for example.)

There are many reasons why the traditional teacher-demonstration of some science experience represents but little of the rationale behind today's concept of the elementary classroom program. Such a procedure is more likely to place focus on facts as most important. The opinion here is that while content is an absolute must, the learning process is of greater weight. Such procedures are more likely to sponsor awesomeness in pupils of those activities called experiments. Pupil psychology would then classify such as for the person professionally trained, for "me" in the distant future maybe. Such procedures are more vicarious than would be the case if the children were "at bat" and all of the other children waiting their turn in the batting order. Such procedures suggest that education is preparation for life in the future rather than that education is alive, here and now as process. Such procedures suggest in terms of present context no relatedness to an overall program. Such procedures suggest authoritarianism as an educative practice. Such procedures suggest that the program is ranged around the teacher's concepts of the child's needs. Such procedures suggest education as separated from reality.

It seems apparent, however, in view of that part of the discussion about demonstrations performed by the teacher, VA, B, C, and D, that there are most excellent opportunities for such to make contribution of great merit to the classroom program. Part VD of the discussion suggests that experiments or demonstrations may provide a rich opportunity for the evaluation of some of the less tangible aspects of learning. We know that the measure of facts "learned" is far short of a measure of the development and growth of pupils in some area of the curriculum, science included. How is the busy elementary classroom teacher going to find a way of assessing the intangibles? One way suggested by Dr. Katherine Hill's [1] analysis of the behavior of children with reference to the development of scientific attitudes and the code which she uses in identification of the elements thereof, is that the busy classroom teacher set up a situation in which she can be an active observer of that which is happening. This teacher will soon be able to discover that John Jones is showing such elements as inquiry, speculation, recognition of causation, postponement of decision, openmindedness critical mindedness, initiative, cooperation, responsibility and many more such qualities. Her dilemma is that of making a record of this. The suggestion made here is that if she decides just what qualities to discover in her pupils, qualities like those above, and if she develops a simple key made up of suitable symbols, easy to remember and quick to record, she has an answer to the problem. If she has a list of each of the names of the group at the time of these quiet observing periods, she can quickly and inconspicuously jot down a suitable symbol beside the name of Sandra who has just shown ability to discriminate by saying, "Planets don't twinkle like stars," or the ability to speculate by saying, "I think the spots come from behind the sun." Again, if this busy teacher is aiming at the assessment of scientific attributes of mind, a key might be made of the various kinds by application of the coding from the table of criteria under II.

[1] Hill, Katherine E., *Children's Contributions in Science Education*, Teachers College, Columbia University, 1947.

GERTRUDE MARIAN YOUNG

THE 1956–57 President of the National Council for Elementary Science was Dr. Gertrude Marian Young. Dr. Young was born in Great Falls, Montana, March 6, 1907. She earned three degrees and a professional diploma from Teachers Colleges, Columbia University — B.S. in 1937; M.A. in 1940; professional diploma in 1948; Ed.D. in 1952. The title of her doctoral study was *Children's Science Experiences for Improved Living.*

Dr. Young's teaching experience includes: Grades 1 to 8, Rural Schools, Hillsdale County, Hillsdale, Michigan, 1926–28; Grades 3, 4, and 5, Public Schools, Battle Creek, Michigan, 1929–34; Grades 3, 4, and 5, Public Schools, Madison, New Jersey, 1934 to January, 1937; Grades 3 and 4, Horace Mann School and Horace Mann-Lincoln School of Teachers College, Columbia University, January 1937—June 1948; Grade 3, Demonstration School, Teachers College, Columbia University, Summers 1939, 1940, and 1941; Lectures on the teaching of reading, visual materials, and elementary science as part of extramural courses at Teachers College, 1941–44; Visiting Instructor, The Pennsylvania State College, State College, Pennsylvania, Summer 1944; Visiting Instructor, Appalachian State Teachers College, Boone, North Carolina, Summers, 1942, 1943, 1945; Visiting Instructor, Springfield, Missouri, Public Schools, June, 1946; Visiting Instructor, Northwestern University, Evanston, Illinois, Summers 1947 and 1948; Visiting Instructor, University of North Carolina, Chapel Hill, North Carolina, Summers, 1949 and 1950; Visiting Instructor, University of Arkansas, Fayetteville and Little Rock, Arkansas, Summers, 1950, 1951, 1952, 1953, 1954, 1955, 1956; Grades 3 and 4, The New Lincoln School, New York City, 1948–1950 (on leave 1951–52); Goucher College, Baltimore, Maryland, 1955–57; University of Florida, Gainesville, Florida, since February, 1957.

Publications and writings by Dr. Young include: "CHILDREN'S SCIENCE EXPERIENCES FOR IMPROVED LIVING," Ed.D. project; "SCIENCE EXPERIENCES AFFORD OPPORTUNITY—WORK ON SIGNIFICANT PROBLEMS" (part of the article with Julian Greenle)—ASSOCIATION OF CHILDHOOD EDUCATION, October 1952; "What Science Means to Children"—METROPOLITAN DETROIT SCIENCE REVIEW, September 1951; "Better Living" (Book of practical suggestions on Food, Clothing, and Housing), Alfred P. Sloan Foundation, New York City, 1945; Writing and Editorial Consultant of eight booklets on Clothing and "Dress for the Weather" (booklet), Experiment in Applied Economics, University of Vermont, Alfred P. Sloan Foundation; Handbook for the film "Problems of Housing," Encyclopedia Britannica Films, Inc., Evanston, Illinois; co-author "Shoo Fly Don't Bodder Me," *Progressive Education*, January, 1945; "History of Lighting"—Unit Lesson No. 90 McCall Publications, Bureau of Publications, Teachers College, Columbia University, 1933; Associate Author with Dr. Arthur Jersild "Child

Development and the Curriculum," Bureau of Publications, Teachers College, Columbia University, 1944; "Let's Find Out Facts About Fabrics," Camp Fire Girls, Inc., 16 East 48th Street, New York, New York, 1957.

Membership in organizations include: National Association for Research in Science Teaching, National Council for Elementary Science, Association for the Education of Teachers in Science, Association for Supervision and Curriculum Development, National Science Teachers Association, Association of Childhood Education International, and National Education Association. Dr. Young was a Regional Director for the National Science Teachers Association, 1954–56. She served as National Council for Elementary Science First Vice-President 1951–52 and as Secretary-Treasurer 1952–54.

CLARENCE M. PRUITT

NATIONAL COUNCIL FOR ELEMENTARY SCIENCE

MARCH 17 AND 18, 1956

REGIONAL MEETING

Hotel New Yorker, New York, N. Y.

Conference Theme: "Elementary Science as a Creative Experience

SATURDAY, MARCH 17th
9:30 A.M.–11:30 A.M.

General Session—North Ballroom

Presiding: CLARK HUBLER, President National Council for Elementary Science, Professor Science, Wheelock College, Boston, Mass.

"Welcome", William H. Bristow, Director, Bureau of Curriculum Research, Board of Education, New York City

Address: *Becoming Creative,* Laura Zirbes, Professor of Education, Emeritus, Ohio State University, Columbus, Ohio

Address: *Teachers—Creators,* N. E. Bingham, Professor of Education, University of Florida, Gainesville, Fla.

Address: *Children—Creative Explorers,* Katherine E. Hill, Associate Professor of Education, New York University, New York City

12:00 Noon–1:30 P.M.

Luncheon

Presiding: DARREL BARNARD, Professor of Education, New York University, New York City

Address: *Concept of Nature,* Roman Vishniac, Freelance Photographer, New York City

1:45 P.M.–3:15 P.M.

Group Discussions

Group I—Room 711

How Can We Recognize and Guide Young Childrens' Science Interests?

Leader: Mary Moffatt, Assistant Professor of Education, Queens College, Queens, New York City

Consultants: Marguerita Rudolph, Teacher of Four Year Old Children, Fresh Meadows Nursery School, New York City; Agnes Burke, Director of Education, Ann Rono Institute, New York City; Nathan Washton, Associate Professor of Education, Queens College, Queens, New York City; Sister Celine, St. Johns College, Cleveland, Ohio, Professor of Science Education; Pauline Scheidt, Teacher First Grade, Manhassett, N. Y.

Group II—Room 712

How Do Children Express their Science Ideas in Words?

Leader: Alice Williams, Associate Professor of Education, State University Teachers College, Potsdam, N. Y.

Consultants: Claudia Lewis, Assistant Professor of Education, Bank Street College, New York City; Kathleen Faucette, Teacher, Second Grade, Bronxville, N. Y.; Leonard Parks, Elementary School Principal, Cedar Grove, N. Y.; Eleanor Johnson, Editor-in-Chief, My Weekly Reader, Middletown, Conn.

Group III—Room 714

How Can Science Books Stimulate Creative Responses in Children?

Leader: Tracy Ashley, Consultant in Elementary Science, Great Neck, N. Y.

Consultants: Avah Hughes, Teacher Fifth Grade, Manhassett, N. Y.; Millicent Selsam, Author, New York City; Alice Dickenson, Editor of First Books, New York City; Alvin Tresselt, Editor, Humpty-Dumpty Magazine, New York City

Group IV—Room 715

What Kinds of Materials Lead Children to Make Their Own Discoveries in Science?

Leader: Leonard Harvey, Teacher Elementary Grades, New York City

Consultants: Mary Rowe, Critic Teacher, Wisconsin State College, Eau Claire, Wis.; Allan Burnham, Science Consultant, Board of Education, New York City; Virginia H. Young, Supervisor of Elementary Education, Baltimore, Md.; June Lewis, Associate Professor of Education, State University of N. Y., Potsdam, N. Y.; Paul Blackwood, Specialist, Elementary Science, U. S. Office of Education, Washington, D. C.; John Kirk, Teacher Sixth Grade, Scarsdale, N. Y.

Group V—Room 740

How Can We Use Audio-Visual Media to Stimulate Individual Responses?

Leader: Etta Schneider Ross, Editor, Creative Science Series, New York City

Consultants: Fred Bartholomew, T. V. Director, New York City; Victor Spevack, Bureau of Audio-visual Education, Brooklyn, N. Y.; Elizabeth Cunningham, Teacher, Fourth Grade, Teachers College, New Britain, Conn.; Paul W. F. Witt, Professor of Education, Teachers College, Columbia University

Group VI—Room 741

How Can We Use Interests in Space Travel to Enrich an Elementary Science Program?

Leader: Rose Wyler, Author, New York City

Consultants: Frank H. Forrestor, Deputy Director, Hayden Planetarium, New York City; Mildred Kiefer, Supervisor of Elementary Education, Phoenix, Ariz.; Franklyn M. Branley, Assistant Professor of Science, State Teachers College, Jersey City, N. J.; Dorothy Roswick, Curriculum Assistant, Air Age Institute, Board of Education, New York City; Louis Cox, Towson State Teachers College, Towson, Md.

Group VII—Room 742

How Can We Use Trips to Open New Areas for Children to Explore?

Leader: John Saunders, School Service Division of the Museum of Natural History, New York City

Consultants: Myron Atkin, Associate Professor of Education, University of Illinois, Urbana, Ill.; Lynn E. Brown, Jr., Waterloo, New York City; Mary Sheckles, Department of Natural Science, Teachers College, Columbia University; Dale Leever, Supervisor of Elementary Agriculture, Los Angeles, Calif.; Guy Bruce, Professor of Education, State Teachers College, Newark, N. J.

3:30 P.M.–4:15 P.M.

Closing Session—North Ballroom

Presiding: CLARK HUBLER, President National Council for Elementary Science, Professor of Science, Wheelock College, Boston, Mass.

Address: *Looking Ahead*, Gerald S. Craig, Professor of Natural Science, Teachers College, Columbia University

SUNDAY, MARCH 18th

9:30 A.M.–11:30 A.M.

Annual Business Meeting—Room 711

CLARK HUBLER, President, and all members of the National Council for Elementary Science

OFFICERS N.C.E.S.—1955–1956

President: Clark Hubler, Wheelock College, Boston, Mass.

First Vice-President: G. Marian Young, Goucher College, Baltimore, Md.

Second Vice-President: Charles E. Burleson, San Francisco State College, San Francisco, Calif.

Secretary-Treasurer: Julian Greenlee, Florida State University, Tallahassee, Fla.

BOARD OF DIRECTORS

Jeff West, Science Supervisor, Stockton Unified School District, Stockten, Col.; Louise Neal, Colorado State College of Education, Greeley, Colo.; Helen Hefferman, State Department of Education, Sacramento, Calif.; Gerald S. Craig, Teachers College, Columbia University, New York City; Rose Lammel, New York University, New York City; Muriel Beuschlein, Chicago Teachers College, Chicago, Ill.

PROGRAM COMMITTEE

G. Marian Young, Goucher College, Baltimore, Md.; Rose Wyler, Author, New York City; Julius Schwartz, School Research Teacher in Science, Bureau of Curriculum Research, New York City

MINUTES OF ANNUAL BUSINESS MEETING N.C.E.S., MARCH 18, 1956

THE Annual Business Meeting of the National Council for Elementary Science, convening in room 711 of the Hotel New Yorker, was called to order at 9:30 A.M. by President, Dr. Clark Hubler. Eighteen members were present.

The minutes of the last years business meeting were read and approved. The financial statement, copy attached, was read and approved. President Hubler called attention to the fact that a number of persons had suggested having some type of an evening session, following the formal Saturday program. Various proposals, including a formal evening session, an evening business meeting, coffee hour, field trip, reception, dinner meeting, and an informal discussion period were discussed. Dr. Young moved that the council recommend that the program chairman consider the possibility of an evening reception and informal discussion. The motion was seconded by Dr. Craig and passed. President Hubler mentioned the duties of the publication committee. These include the NCES issue of the Elementary Science Bulletin, the Elementary Science Issue of *Science Education,* and news letters. It was suggested that the committee give careful consideration to planning the NCES issue of the Elementary Science Bulletin so that it will actually be representative of the National Council for Elementary Science. It was thought that news letters might be of interest to persons not members of NCES, that they might call attention to items of interest, news briefs, some current issues. President Hubler named a publications committee consisting of Julian Greenlee, Chairman, Miss Elizabeth Cunningham, New Britain, Connecticut, and Dr. A. Piltz, of the University of Florida. (Subsequent planning by the committee provided that Miss Cunningham will assume leadership in connection with the news letter, while Dr. Piltz will be primarily responsible for the NCES Issue of the Elementary Science Bulletin).

Procedures for facilitating registration of persons attending the annual meetings were discussed. Suggestions made were: Provide a short summary of information about the Council that each attendee would read and then hand in after signing the same. The National Council for Elementary Science is an organization of classroom teachers, principals, supervisors, and science specialists. The wearing of name tags would facilitate renewing acquaintances and make new ones. Dr. Bingham moved that we recommend that plans be made for registration by all attendees and enrollment in the organization for those who wish it. The motion was seconded by Dr. Young and approved.

The nominating committee consisting of Dr. Paul Blackwood, Chairman, Dr. Ned Bingham, and Dr. Katherine Hill nominated Dr. G. Marian Young, Professor of Education, Goucher College, Towson, Md. President, Mr. Joe Zafferoni, School of Education, University of Nebraska, Lincoln, Nebraska, First Vice-President, Miss June Lewis, State Teachers College, Plattsburg, New York, Second Vice-President, Dr. Julian Greenlee, Professor of Education, Florida State University, Tallahassee, Florida, Secretary and Treasurer, and Miss Bonnie Howard, Board of Education, Louisville 8, Kentucky, Member of the Board of Directors. On President Hubler's statement that additional nominations might be made from the floor, Dr. Craig moved that the Secretary be instructed to cast a unanimous ballot for election of the slate as presented. The motion was seconded by Dr. Piltz and passed.

Dr. Blackwood called attention to the fact that the National Council for Elementary Science has an annual meeting in con-

nection with the Association for Supervision and Curriculum Development and another with the Association for Childhood Education International. He further discussed the desirability of involving persons from all sections of our country in the programs. Dr. Craig suggested that we might at some time consider the desirability of changing the name of the organization to the National Council for Elementary Science International. He said that the meetings were attended by people from many countries and specifically that Mr. Douglas Stuart of Nicaragua was visiting the business meeting. President Hubler reminded the people responsible for planning the programs that the organization was primarily for classroom teachers and that they should thus be well represented among program personnel.

Dr. Blackwood said that, over a period of time, the meetings in connection with both the Association for Supervision and Curriculum Development and the Association for Childhood Education International had been well planned and well attended. Sister M. Celine requested information as to whether these organizations were equally responsive to our needs. She was assured that they were. Mr. R. S. Austin remarked that he had attended a number of our meetings and was enthusiastic about the quality of the programs as well as the numbers in attendance. Dr. Blackwood moved that we commend the local program committee, particularly Dr. Young, Chairman, for accepting an assignment and doing it well. The motion was seconded by many members and passed.

There being no further business the meeting adjourned.

Respectfully submitted,
JULIAN GREENLEE
Secretary-Treasurer, NCES

MINUTES OF ANNUAL EXECUTIVE BOARD MEETING N.C.E.S.

PRESIDENT, Clark Hubler called the meeting of the Executive Board of the National Council for Elementary Science to order at their meeting in the New Yorker Hotel, Sunday, March 18, 1956.

Members present were Dr. Gerald Craig, Professor of Natural Sciences, Teachers College, Columbia University, New York 27, N. Y., Dr. Julian Greenlee, Professor of Education, Florida State University, Tallahassee, Florida, Miss Bonnie Howard, Board of Education, Louisville 8, Kentucky, Dr. Clark Hubler, Professor of Science, Wheelock College, Boston, Massachusetts, Miss June Lewis, State Teachers College, Plattsburg, New York, Dr. G. Marian Young, Professor of Education, Goucher College, Towson, Maryland, and Mr. Joe Zafferoni, School of Education, The University of Nebraska, Lincoln, Nebraska.

The Executive Board of the Council further evaluated the program of the preceding day and helped the newly elected officers to better understand their responsibilities. Mr. Zafferoni was instructed to assume the leadership as program chairman for the annual meeting to be held in conjunction with A.S.C.D. Miss Lewis was charged with the major responsibility in arranging the meeting in connection with the ACEI.

Attention was called to an outstanding bill of $105.00 to Science Education for copies of Science Education sent to members in 1955 as well as to current bills in connection with the organization. Dr. Craig moved that the treasurer be authorized to pay the bills as indicated. (See financial record.) Dr. Young seconded the motion and it was passed.

Dr. Greenlee raised a question as to whether the organization should pay part of the travel expenses for program chair-

men. Some discussion followed. It was pointed out that this had never been done, that chairman living a considerable distance from the place of meeting ordinarily delegated much responsibility to local people, and that it was desirable, when possible to name a program chairman with the location of the meeting place in mind.

The Board instructed Dr. Young, chairman of the New York Program Committee and President elect, to convey to her committee and to program participants the Council's feeling of gratitude for an important assignment, well planned and well executed.

There being no further business, the meeting adjourned.

Respectfully submitted,
JULIAN GREENLEE
Secretary-Treasurer, NCES

NATIONAL COUNCIL FOR ELEMENTARY SCIENCE

IN COLLABORATION WITH ASSOCIATION FOR CHILDHOOD EDUCATION INTERNATIONAL

SATURDAY, APRIL 7, 1956

Washington, D. C.

PROGRAM

SATURDAY, APRIL 7, 1956,
THE PARK ROOM, SHOREHAM HOTEL

Presiding: CHARLES E. BURLESON, San Francisco State College, Second Vice-President, N.C.E.S.

9:30–9:45 "Welcome," Margaret R. Pepper, Executive Assistant to the Superintendent of Schools, Washington, D. C.

9:45–10:45 Address: "Where Are We in Elementary Science Education?", Paul E. Blackwood, Specialist in Elementary Science, U. S. Office of Education, Washington, D. C.

10:45–11:10 Coffee Break.

11:15–12:00 Address: "Making the Most of Demonstrations in Elementary Science," Evan C. Richardson, Associate Professor of Science, New Jersey State Teachers College, Newark, N. J.

12:00–12:30 "Conference Summary," Glenn O. Blough, University of Maryland, College Park, Md.

This program has been arranged by Charles Burleson of the Council and by members of the local Committee: Jeanie Treichel, Washington, General Chairman; Helen E. Hale, Towson, Md.; Edna Mae Merson, Balitmore, Md., and Shirley Connor, Randallstown, Md., registration; Duryea Morton, exhibit; Thelma Johnson, Washington, hostess.

NATIONAL COUNCIL FOR ELEMENTARY SCIENCE

IN COLLABORATION WITH ASSOCIATION FOR SUPERVISION AND CURRICULUM DEVELOPMENT

MARCH 16–17, 1957
Sheraton Jefferson Hotel,
St. Louis, Missouri

"Science Yesterday, Today and Tomorrow For Our Children"

9:00 to 11:00 General Session, Boulevard Room

Presiding: G. MARIAN YOUNG, Goucher College, Baltimore, Maryland, President, N.C.E.S.

"Welcome", Philip J. Hickey, Superintendent of Instruction, St. Louis, Mo.

Address: "Elementary Science, Background For Today's World", Donald G. Decker, Director of Instruction, Colorado State College of Education, Greeley, Colo.; "Science For Children Throughout The World", Willard J. Jacobson Assoc. Prof. Natural Science, Teachers College, Columbia University, New York, N. Y.

12:00 to 1:45 Luncheon, Room 1

Presiding: BONNIE HOWARD, Supervisor, Louisville, Kentucky, Member of Board of Directors N.C.E.S.

Address: "Sift Fact From Fiction In Rockets And Space Travel," John Sternig, Elementary Principal, Public Schools of Glencoe, Glencoe, Ill.

Tour of Exhibit, "Science Experiences For Today's Children." Prepared by St. Louis Elementary Schools.

2:00 to 3:30 Group Discussions

Area 1, Room 1

"Science In Early Childhood Education: Appraisal and Planning For The Future."

Leader: Etheleen Daniel, Supervisor Elementary Education, Rockville, Md.

Consultants: Jessie Elliff, Supervising Principal, Sunshine School, Springfield, Mo.; Hillis Howie, Principal, Community School, St. Louis County, Mo.; Harriet Bick, Division of Audio-Visual Education, St. Louis, Mo.

Area 2, Room 2

"Science For Intermediate And Upper Grades, Appraisal And Panning For The Future."

Leader: Arnold Lahti, Department of Science, Western Washington College of Education, Bellingham, Wash.

Consultants: Mervin Johnson, Assistant in Elementary Education, University of Nebraska, Lincoln, Neb.; Ruth Roche, Los Angeles State College, San Fernando Valley Campus, Northridge, Calif.; Sue Bleikamp, Teacher, Blackberry Lane School, University City, Mo.; Paul Neel, Teacher, Walnut Park School, St. Louis, Mo.

Area 3, Room 3

"Experiences In Problem Solving For Today's Children."

Leader: Al Piltz, Consultant Elementary Education Science, City of Los Angeles, Los Angeles, Calif.

Consultants: Clair Brewer, Principal, Doling School, Springfield, Mo.; Ruth Cornelius, Teacher, Hempstead School, St. Louis, Mo.; Jenning Biebel, Teacher, Hanley Junior High School, University City, Mo.; Marie Gaffron, Teacher, Buder School, St. Louis, Mo.

Area 4, Room 7

"Living Science Through Outdoor Education With Children."

Leader: O. E. Swanson, Director of Elementary Education, Dundee, Ill.

Consultants: Rex Conyers, Science Consultant, University City, St. Louis County, Mo.; Laura Gibson, Jackson Park School, University City, St. Louis County, Mo.; Lucille Thimblin, Curr. Coordinator, Park Forest, Ill.

Area 5, Room 8

"A Program of Science Based On A Developmental Approach"

Leader: E. Bernice Owens, Professor Elementary Education, Phillips University, Enid, Okla.

Consultants: Mildred Eaton, Principal, Oak Grove School, Springfield, Mo.; Pearl Yeager, Teacher, Windsor School, St. Louis, Mo.; Orval Conner, Asst. Principal, Holmes School, Lincoln, Neb.

Area 6, Room 9

"Science For Children Through Radio and Television."

Leader: John Whitney, Dean of Instruction, Harris Teachers College, St. Louis, Mo.

Consultants: Gertrude Hoffsten, Elementary Program Coordinator, Radio Station KSLH, St. Louis, Mo.; Helen Heigold, Teacher, Jackson School, St. Louis, Mo.

3:30 to 4:45 Closing Session, Boulevard Room

Presiding: G. MARIAN YOUNG, President, N.C.E.S.

Evaluation: "Where Are We? Where Are We Going?" Julian Greenlee, Professor of Education, Florida State University, Tallahassee, Fla.

SUNDAY, MARCH 17

9:00 to 9:30 Evening Informal Coffee Hour "Talk Around" Room 7

9:30 to 11:30 Annual Business Meeting, Ivory Room

G. MARIAN YOUNG, President and All Members of National Council For Elementary Science.

This program has been arranged by Joe Zafforoni of the Council and by members of the local committee: John Whitney, Harris Teachers College, St. Louis, Mo.; Rex Conyers, University City Schools, St. Louis County, Mo.; Elizabeth Golterman, Division Audio-Visual Education, St. Louis, Mo.

OFFICERS OF N.C.E.S. 1956 TO MARCH 1957

President: Dr. G. Marian Young, Professor of Education, Goucher College, Baltimore, Md.

1st Vice-President: Mr. Joe Zafforoni, Assistant Professor of Education, University of Nebraska, Lincoln

2nd Vice-President: Miss June Lewis, Professor of Education, State Teachers College, Plattsburg, N. Y.

Secretary-Treasurer: Dr. Julian Greenlee, Professor of Education, Florida State University, Tallahassee, Fla.

Board of Directors: Dr. Clark Hubler, Professor of Science, Wheelock College, Boston, Mass.; Miss Bonnie Howard, Board of Education, Louisville 2, Ky.; Mrs. Muriel Beuschlein, Department of Science, Chicago Teachers College, Chicago 21, Ill.; Dr. Rose Lammel, Professor of Education, New York University, Wash. Sq., New York; Dr. Gerald Craig, Professor of National Science, Teachers College, Columbia University, New York 27, N. Y.; Dr. Helen Heffernan, Chairman, Department of Elementary Education, State Department of Education, Sacramento, Calif.

NOTES ON N.C.E.S. GROUP MEETINGS

MARCH 16, 1957

ST. LOUIS, MISSOURI

Area 2

Summary: "Science in Early Childhood Education: Appraisal and Planning for the Future"

The group began by taking a problem census of all participants and deciding how to use our time. These questions and problems seemed to reflect some appraisal about science experience for young children.

Some of the problems raised were: What meaningful experiences can young children have that lead to better understanding of their environment? How may we develop concepts? What materials and equipment are most useful? How may we develop greater competence and confidence in providing children with science experiences?

This last problem was discussed and the following ideas were proposed and desirable practices given by different participants: Take into account factors about child growth and development at each age level. Try to develop children's natural curiosity in the world around them. Provide opportunities for teachers to discuss and participate in preparation of teacher guides. Provide some basic and simple materials and equipment needed in experimentation. Secure consultant service when possible. Give considerable latitude in scope of science experiences in order to take into account the differences in children's backgrounds. Make use of books now available for children and teachers. Take children into the out-of-doors for greater understanding when possible. Develop ability to observe, deepen concern and responsibility for environment. Give attention to concept development. The group believed that in helping children to interpret their environment we help them to become more resourceful and responsible. In the exchange of these ideas about practices of science experiences underway in many places, there were many proposals that will no doubt call for more planning in the future.

Etheleen Daniel,
Leader

Area 4

"Living Science Through Outdoor Education With Children"

Small group—only eight persons in attendance. Other group discussions concerning "classroom science teaching" seemed to hold more appeal to conferences.

Since Mrs. Lucille Thimblin had shown slides and described the outdoor education program at Park Forest, Illinois during the luncheon program, this afternoon group discussion was used mainly for a discussion of the outdoor education program as conducted in the University City, Missouri schools. The discussion was illustrated with excellent slides by Rex Conyers. Laura Gibson added comments from time to time.

The slides shown by Mr. Conyers pointed out how exceptionally well science comes alive for pupils when they live with it outdoors. The University City schools send sixth graders to a forest preserve camp for a full week. Fifth graders throughout the schools, however, prepare for this venture by being trained in observing during "school campus" trips throughout all seasons of the school year. During these observations the pupils learn how rich the everyday environment is in interesting science specimens and phenomena. This year of readiness at fifth grade level makes the week of outloor living at sixth grade level that much more productive and meaningful.

The group felt that much more publicity needs to be given to "outdoor living for school children" in professional magazines. There is a dearth of information regarding

program set-up, cost, and other arrangements.

It was felt that professional training institutions should include help for prospective teachers so they may be efficient conductors of "outdoor school living." It was mentioned that Northern Illinois State College at DeKalb includes courses in "outdoor living" in their curriculum. Those enrolling in the courses "live and learn" together at an outdoor camp "Lorado Taft Field Campus."

Park Forest, Illinois, schools have an orientation program for teachers each fall. The teachers spend from two to three days at a forest preserve camp. Naturalist are on hand to make the environment more meaningful to the teachers.

This meeting afforded an excellent chance for the interchange of ideas. Mimeographed bulletins and materials were also exchanged.

O. E. Swanson
Group Leader

Area 5

"A Program of Science Based on a Development Approach"

To begin with many questions were raised as to the *meaning* of "Developmental Approach in Science." A few suggestions were that:

1. We should take into consideration the child's stage of readiness.
2. We should think of science as it relates to the child's total growth.
3. We should think in terms of spiral growth—a growing pattern or building as he goes on.
4. We should begin with the childs immediate interest—as related to his environment.

As Dr. Zirbes has said "We are trying to develop aspirations and concerns as well as knowledges and skills."

The question was raised "What do you find to be some of your greatest problems in this approach"?

Some of the problems mentioned were:

1. Teachers feel insecure.
2. The time element is of concern to some.
3. Grading may affect teachers methods and techniques.
4. There may be concern as to how far or how deep we should go in developing the program.
5. There is a question as to materials.
6. Can the developmental approach be the unit type or how can we tie the program together?

Time did not permit discussion of all the problems involved. However, many problems were related, and enthusiastic discussion followed with every member of the group participating.

The members agreed that the main objective is "Developing the Scientific Attitude." Therefore we must take teachers where they are and try to help them as they work with boys and girls. Many valuable ideas on the Developmental Approach in the Science Program were shared throughout the discussion.

It was recommended that this council make a study of how we can improve on the science courses taught in colleges for teachers going into elementary education.

Mattie Belle Rogers
Recorder for Group No. 5

MINUTES FOR THE NATIONAL COUNCIL FOR ELEMENTARY SCIENCE

Annual Business Meeting—March 17, 1957

The annual business meeting of the National Council for Elementary Science was held in the Ivory Room, Jefferson Hotel, St. Louis, Sunday morning, March 17, with Dr. Marian Young presiding. There were twenty-two members present.

In the absence of Julian Greenlee, Ned Bingham read the minutes of the last meeting. They were approved as read. The president introduced the business session by asking the question "How many receive the Elementary School Science Bulletin"

which provoked much discussion. This bulletin, as we know, is published six times a year by the National Science Teachers Association, and should be sent to each member of N.C.E.S. Some members present, who are also members of N.S.T.A., had not received it.

After much discussion Ned Bingham moved that the secretary, Julian Greenlee, be instructed to check the N.S.T.A. roll and to list the members of N.C.E.S. who are also members of N.S.T.A. (Since these members receive the *Science Bulletin* automatically, he moved that additional copies be purchased from N.S.T.A. office and mailed to all *other* members of N.C.E.S.) Mr. Greenlee should send the list of members of N.C.E.S. who are *not* members of N.S.T.A. to N.S.T.A. Headquarters with the request that N.S.T.A. office mail to these members all six issues of the Elementary Bulletin in an envelope of N.C.E.S.

One issue of this *Science Bulletin* for 1957–1958 will be sponsored by N.C.E.S. Dr. Louis Evans, Columbus, Ohio, offered to be responsible for assembling the materials. Suggestions for the issue: *How to use the school environment for interesting work in science; How to use radio and television in elementary science, International Geophysical Year and Elementary Science; How science challenges the gifted; The Conservation program in the state of Ohio.*

It was brought to our attention that Elizabeth Cunningham, editor of the *Newsletter,* could not assume responsibility for the work another year. Dr. Craig suggested that the *Newsletter* serves a purpose and wanted to see it continued. After some discussion, it was decided that we should enlarge its coverage to include people and events in the field of science, suggestions for science through radio and television, a floor plan of Joe Zafforoni's science room and description of materials, and new curriculum guides. Lynn Brown, Jr. offered to be responsible for the May issue of the *Newsletter.* Miss Young appointed the following members to assemble news for future *Newsletters* and send to Lynn Brown, Jr.:

Al Piltz, Los Angeles, Cal.
Joe Zaffaroni, University of Nebraska, Lincoln, Neb.
Dorothy Dreisbach, Elementary Education, Public Schools, Louisville, Ky.
Marian Young, College of Education, Univ. of Florida, Gainesville, Fla.

Dr. Craig described a national research group in science N.A.R.S.T.—quoting from a letter from Dr. Pruitt. He suggested that N.C.E.S. meet with them at their session for the purpose of furthering the work of elementary science. Dr. Craig moved that some member be appointed to enter in correspondence with Dr. Pruitt and explore the desirability of a joint N.C.E.S.-N.A.R.S.T. meeting. Mr. Evans suggested that Muriel Beuschlein confer with Dr. Pruitt concerning a plan for a joining N.C.E.S.-N.A.R.S.T. meeting in 1958 and to consider February 1958, in Chicago as proposed by Dr. Pruitt. Dr. Craig suggested that the three organizations, N.C.E.S., N.A.R.S.T. and A.E.T.S. might meet jointly for the purpose of considering some phase of research in Elementary Science, Teacher Education programs for Science teaching and other possible ideas.

If the result of the correspondence between Muriel Buschlein and Dr. Pruitt indicates value in a meeting sponsored by N.C.E.S.-N.A.R.S.T. or N.C.E.S.-A.E.T.S.-N.A.R.S.T., Muriel was empowered to proceed in the planning of such a program.

One of the new members suggested that more publicity be given the organization—announcement of the annual meeting of the N.C.E.S. to be sent to *Educational Leadership, Educational Journal* for each state, *N.E.A. Journal* and local papers.

It was suggested that greater responsibility for the job of publicity and public relations should be assumed by the president and a drive to enlarge the membership be planned.

Mr. Evans, Chairman of the Nominating

Committee, submitted the following slate which was approved:

President: Joe Zaffaroni, University of Nebraska, Lincoln, Neb.
First Vice-President: Willard Jacobson, Teachers College, Columbia University, New York City, N. Y.
Second Vice-President: June Lewis, University State Teachers College, Plattsburg, N. Y.
Secretary-Treasurer: Julian Greenlee, Florida State University, Tallahassee, Fla.
Board of Directors: Al Piltz, Los Angeles, Cal.

In a discussion the problems of long distance planning were considered for the First and Second Vice Presidents. The meeting with the A.S.C.D. Conference will be in Seattle in March 1958, and the N.C.E.S. meeting with A.C.E.I. in Boston in April 1958. Since June Lewis, as Second Vice President had the task of the 1957 meeting in Los Angeles, and was absent to accept the office of First Vice President, it was suggested by Dr. Jacobson that Dr. Lewis be given the opportunity to choose the office of First or Second Vice Presidency, and that he would accept either office.

Dr. Jacobson suggested that a letter of thanks be written to Joe Zaffaroni and the local committee for planning the excellent 1957 program.

It was agreed that the coffee hour held Saturday evening was considered valuable and should be continued.

There being no further business, the meeting adjourned.

Respectfully submitted,
Bonnie C. Howard
Secretary pro tem

MINUTES OF N.C.E.S ANNUAL EXECUTIVE BOARD MEETING
March 17, 1957

President, G Marian Young, called a meeting of the Executive Board of the National Council for Elementary Science following the Annual Business meeting of N.C.E.S. at the Jefferson Hotel, St. Louis, March 17, 1957.

Members present included:

Professor Gerald Craig, Teachers College, Columbia University
Miss Bonnie Howard, Board of Education, Louisville, Ky.
Mrs. Muriel Beuschlein, Chicago Teachers College, Chicago, Ill.
Joe Zaffaroni, University of Nebraska, Lincoln, Neb.
Al Piltz, Los Angeles County, Cal.
Willard Jacobson, Teachers College, Columbia University
G. Marian Young, School of Education, University of Florida, Gainesville, Fla.

The Executive Board discussed the program held the previous day and the pending N.C.E.S. meeting to be held in Los Angeles, California, following the A.C.E.I. Conference on April 25 and 26. Al Piltz moved that in subsequent N.C.E.S. meetings the local committee be given more freedom to work out the details within the overall structure as might be set up by the Vice-Presidents. Discussion resulted in approval.

Mr. Zafforoni, newly elected President of N.C.E.S., was instructed to write to Rod Tillman, Executive Secretary of A.S.C.D., that N.C.E.S. would plan to have a meeting in Seattle at the time of the Annual A.S.C.D. Conference, 1958. Marian Young, outgoing President of N.C.E.S., was instructed to write to both A.S.C.D. and A.C.E.I. organizations to acknowledge appreciation of cooperative efforts of both organizations in holding N.C.E.S. meetings with them.

Marian Young was instructed to confer with June Lewis to secure her choice of accepting the office of first or second Vice-President, at which time, Willard Jacobson and June Lewis should begin planning of

the N.C.E.S. meetings to be held with A.S.C.D. in Seattle in March, 1958, and A.C.E.I. in Boston in April, 1958. It was recommended that Joe Zafforoni plan publicity for these meetings before December, 1957, with special effort to have the program printed in as many state education magazines as possible as well as in national educational publications.

Marian Young and Joe Zafforoni were asked to draw up a list of recommendations for newly appointed officers as their present offices terminated.

Recent articles in popular magazines describing elementary science practices were considered objectively. It was proposed that the Council might be alert to the implications of such articles in current magazines. The *Newsletters* to be sent to members of N.C.E.S. might be a way to counteract questionable practices, and emphasize the purposes advocated by the Council. It was suggested that an article, written and approved by N.C.E.S. officers, to show a contrast in their point of view and the ones implied in the above mentioned articles might be considered.

The secretary-treasurer, Dr. Julian Greenlee, was authorized to pay all outstanding bills. The Board instructed Joe Zafforoni, chairman of the St. Louis meeting, to express appreciation to his local committee and to all participants, conveying the Council's gratitude for their support and contributions.

The meeting adjourned.

Respectfully submitted,
MARIAN YOUNG and
BONNIE HOWARD
In absence of secretary-treasurer, Julian Greenlee

NATIONAL COUNCIL FOR ELEMENTARY SCIENCE

IN COLLABORATION WITH ASSOCIATION FOR CHILDHOOD EDUCATION, INTERNATIONAL

Hotel Statler and Administrative Offices of Los Angeles City Board of Education, Los Angeles, California

APRIL 26–27, 1957

Theme: "The Problem Solving Approach in Children's Science Experiences"

Hosts: Members of Elementary School Science Association of So. California

FRIDAY, APRIL 26

9:30–11:00 Informal Discussion, Inquire at registration table for room assignment

"Pre-service and In-service Training in Science," Dr. Charles Burleson, San Francisco State College, Chairman

2:00–5:00 Field Trip, La Brea Tar Pits; Hancock Park; Los Angeles County Museum; Exposition Park

Chairman: Thelma Epley, President of Elementary School Science Association of Southern California; Ruth Price, Past President of Elementary School Science Association of Southern California

(Advance trip arrangements may be made at N.C.E.S. Registration Table. See A.C.R.I. Conference Bulletin for details.)

6:30–7:30 Discussion Group Leaders and Consultants meet, Los Angeles Room, Hotel Statler. Dr. Albert Piltz, Los Angeles County Schools, Chairman.

7:30–10:00 Registration and Meeting, Los Angeles Room, Hotel Statler

Address: "Frontiers In Avionics," Dr. James March, Vice-President, Systems Laboratories, Inc. (Laboratory in charge of assembling Earth-Satellite.)

Social Hour

Eugenia Bernthal and Fredricka Passmore, Vice-Presidents of Elementary School Science Association of Southern California

SATURDAY, APRIL 27

Administrative Offices of Los Angeles City Board of Education, 450 North Grand, Los Angeles, Calif.

Presiding: JUNE E. LEWIS, N.C.E.S. Conference Chairman, State University Teachers College, Plattsburg, N. Y.

8:00– 9:00 Registration and Exhibits

9:00–10:00 "Welcome and Greetings," Dr. Paul Shafer, Associate Superintendent, Division of Elementary Education, Los Angeles, Calif.

Address: "Using the Problem Solving Approach in Childrens' Science Experiences," Robert Stollberg, San Francisco State College, San Francisco, Calif.

10:00–11:25 Work-Discussion Group Meetings

Groups I, II, III, and IV will deal with problem-solving situations in specific content areas. Procedures, techniques, experiments, and resources appropriate for both younger and older elementary school children in grades—kindergarten through ninth—will be considered. Persons interested in very young children should plan to attend A Sections; persons interested in older children should plan to attend either B or C Sections.

(Coffee will be served in the Work-Discussion Conference Rooms, courtesy of the Elementary School Science Association of California.)

Group I. "Using Childrens' Interests in the Earth-Satellite and Space Travel as Problem-Solving Situations"

B. Section, Foyer of Auditorium

Leader: Charles E. Burleson, San Francisco State College, San Francisco, Calif.

Consultants: Mary C. Durkin, Centra Costa County Schools, Martinez, Calif.; Edward J. Herrington, San Jose State College, San Jose, Calif.; James Lefeber, Washington School, Riverside, Calif.; Lorraine Peterson, Los Angeles City Schools, Los Angeles, Calif.

C. Section, Stage of Auditorium

Leader: Herbert Drapkin, Fullerton Junior College, Los Angeles, Calif.

Consultants: Frank Gillette, Monterey City Schools, Monterey, Calif.; Elizabeth Winkler, Mark Twain Junior High School, Los Angeles, Calif.

Group II. "Using Childrens' Interest In Weather as Problem-Solving Situations"

A. Section, Northeast end of Cafeteria

Leader: William Lyle, Los Angeles City Schools, Los Angeles, Calif.

Consultants: E. Bernice Owens, Phillips University, Enid, Okla.; Bernice Christenson, Los Angeles City Board of Education, Los Angeles, Calif.; Charlene Royer, Los Angeles City Schools, Los Angeles, Calif.; Una Smithwaite, Los Angeles State College, San Fernando Valley Campus, Los Angeles, Calif.; Matthew F. Vessel, San Jose State College, San Jose, Calif.

B. Section, Southeast end of Cafeteria

Leader: William Weichert, Oakland Public Schools, Oakland, Calif.

Consultants: Henry Demitt, West Covena School District, West Covena, Calif.; Kristine K. King, Sunnyside School, Tucson, Ariz.; Alta Miller, Jordan School District, Sandy, Utah; Richard Robinson, Los Angeles City Schools, Los Angeles, Calif.

Group III. "Using Childrens' Interests In Conservation as Problem-Solving Situations"

A. Section, Small Cafeteria

Leader: Marie Pabst, Western Washington College of Education, Bellingham, Wash.

Consultants: Beatrice Hurley, New York University, New York, N. Y.; Elizabeth C. Ray, Canyon Crest School, Riverside, Calif.; Mary Oelrich, Pomona City Schools, Pomona, Calif.; Ruth M. Price, Hawthorne School District, Hawthorne, Calif.; J. Martin Weber, Sacramento County Schools, Sacramento, Calif.

B. Section, Instructional Service Building, Curriculum Laboratory

Leader: Helen Myers, Long Beach Schools, Long Beach, Calif.

Consultants: Bernice Bryan, Los Angeles County Schools, Los Angeles, Calif.; Dale W. Leever, Los Angeles City Schools, Los Angeles, Calif.; Henee Le Roy, Pasadena City Schools, Pasadena, Calif.; Arne J. Nixon, Tulare City Schools, Tulare, Calif.; Richard Swinehart, Long Beach City Schools, Long Beach, Calif.; Herbert Wong, Oakland City Schools, Oakland, Calif.

Group IV. "Using the Childrens' Interests In Atomic Energy as Problem-Solving Situations"

B. Section, Instructional Services Building, Art Room

Leader: Madge Stanford, Southern Methodist University, Dallas, Tex.

Consultants: Archie MacLean Owen, Los Angeles City Schools, Los Angeles, Calif.; Richard S. Purviance, Lowell, School, Riverside, Calif.; Robert D. Rhodes, Long Beach State College, Long Beach, Calif.; William D. Unsicker, Coronado Public Schools, Coronado, Calif.

11:00–1:00 Closing Session, Auditorium

Address: "Trends In Elementary Science For Children During the Last Century," Gerald S. Craig, Professor Emeritus, Teachers College, Columbia University, New York, N. Y.

Panel Discussion Based On Outcomes of Work-Discussion Groups

Moderator: Albert Piltz, Los Angeles County Schools, Los Angeles, Calif.

Panel Members: Work-Discussion Group Leaders

LOCAL PLANNING COMMITTEE

Chairman: Ruth Roche, Los Angeles State College, San Fernando Valley Campus, Los Angeles, Calif.

Corresponding Secretary: Marjorie Purcel, La Canada School District

Exhibits: Bernice Christenson, Los Angeles City Schools; Tom Trammel, Los Angeles State College, San Fernando Valley Campus

Registration: Bernice Bryan, Los Angeles County Schools

Social Arrangements: Eugenia Bernthal, Pasadena City Schools, Fredricka Passmore, San Bernadino City Schools

Publicity: Albert Piltz, Los Angeles City Schools

Hosts: The Elementary School Science Association of Northern Calif.; The Elementary School Science Association of Southern Calif.

The officers and members of N.C.E.S. wish to express their appreciation for the wholehearted cooperation and hospitality received from the Local Planning Committee and the Los Angeles City Schools

NATIONAL COUNCIL FOR ELEMENTARY SCIENCE

WHAT IS IT?

The National Council for Elementary Science is an organization for improving science teaching in the elementary schools of the nation.

WHAT ARE ITS PURPOSES?

To promote a science curriculum for the elementary grades which will be a part of the continuous and integrated science program for the entire school.

To promote study of problems involved in the methods and techniques of science teaching in the elementary school.

To further the pre-service and in-service education of teachers for teaching science in the elementary school.

WHO BELONGS TO THE COUNCIL?

Elementary classroom teachers, supervisors, college instructors, and other persons interested in working at the local, state, or national level to improve science teaching are members of the council.

COUNCIL ACTIVITIES

The council will hold, during the year 1957–58, meetings with A.S.C.D. in Seattle, A.C.E.I. in place to be designated, and with N.A.R.S.T. in Chicago. The council periodically distributes teaching suggestions and materials, including the N.S.T.A. elementary school science bulletin, and the elementary science issue of Science Education.

OFFICERS OF N.C.E.S. 1957–58

President: Mr. Joe Zafforoni, Assistant Professor of Education, University of Nebraska, Lincoln, Neb.

1st Vice-President: Dr June Lewis, Professor of Education, State Teachers College, Plattsburg, N. Y.

2nd Vice-President: Dr. Willard Jacobson, Associate Professor of Education, Teachers College, Columbia University, New York 27, N. Y.

Secretary-Treasurer: Dr. Julian Greenlee, Professor of Education, State University, Tallahassee, Fla.

Board of Directors: Dr. G. Marian Young, Professor of Education, University of Florida, Gainesville, Fla.; Dr. Al Piltz, Board of Education, Los Angeles, Calif.; Miss Bonnie Howard, Board of Education, Louisville 2, Ky.; Mrs. Muriel Beuschlein, Science Department, Chicago Teachers College, Chicago 21, Ill.; Dr. Rose Lammel, Professor of Education, New York University, Washington Square, N. Y.; Dr. Gerald S. Craig, Professor Emertius, Teachers College, Columbia University, N. Y.

CENTRAL ASSOCIATION OF SCIENCE AND MATHEMATICS TEACHERS

ANNUAL CONVENTION FOR 1957

WHEN? NOVEMBER 28–30, 1957
WHERE? CONGRESS HOTEL, CHICAGO, ILL.

Features of the Program

Thursday evening: Open meeting, Board of Directors. Theme: "The Future of C.A.S.M.T.: What are We Working For?"

Friday morning: General session, speaker Dr. Stuart McLain, Associate Director of Argonne National Laboratories: "The Nation's Senior Atomic Energy Laboratory—Past, Present and Future."

Friday afternoon: tours

1. To Argonne National Laboratories, Lamont, Ill. Limited to 200 participants, advance registration required. Transportation costs, $2.00.
2. To Adler Planetarium, special program regarding the International Geophysical Year, with sub-tours from there to either the Museum of Science and Industry or the Chicago Museum of Natural History.

Friday afternoon: hotel program

Demonstrations by Illinois Bell Telephone Company on the Solar Battery and on Transisters.

Symposia on "What's Newest in Mathematics" and "What's Newest in Science."

Continuous showings of newest available sound films in color on the sciences and mathematics, including the latest Bell Telephone System film, "The Strange Case of The Cosmic Rays."

Friday evening: General session speaker: Nobel Prize Winner, Prof. Harold C. Urey, University of Chicago. Topic: "Science, Mathematics and Culture."

Special feature: Reception honoring Dr. and Mrs. Glen Warner, recently retired after thirty one years of service to science and mathematics education in the editorship of School Science and Mathematics.

Saturday morning: Subject-matter section Programs, usually held on Friday.

Saturday noon: luncheon. Speaker: Dr. G. Truman Hunter, of IBM. Topic: "Minds Mathematics and Machines."

Request for copies of the complete program shoud be directed to: C.A.S.M.T. P. O. Box 408, Oak Park, Illinois.

JOHN CLARENCE WELLS

DOCTOR JOHN CLARENCE WELLS of Madison College, Harrisonburg, Virginia served as 1956–57 President of the Association for the Education of Teachers in Science. Dr. Wells was born in Philadelphia, Pennsylvania, January 12, 1914. He graduated from the Columbia High School, Maplewood, New Jersey, in 1932. Majoring in Physics, he received an A.B. degree from Colgate University in 1937. He earned the M.A. (1940) and Ed.D. (1950) degrees from Columbia University. The title of his doctoral study at Columbia University was *A Manual of Photogaphy For Teachers.*

Teaching experience includes high school science and mathematics at the Pleasant Hill Academy, Pleasant Hill, Tennessee (1937–39); Walt Whitman School, New York City (1939–40); Dobbs Ferry High School, Dobbs Ferry, New York (1940–

42); and Pleasantville High School, Pleasantville, New York (1945–46). He was assistant in the Natural Science, Teachers College, Columbia University, 1946–47. He went to Madison College in 1947 and is now Professor of Physics and Head of the Physics Department.

During World War II (1942–45), Dr. Wells was Ballistics Supervisor at the Radford Ordinance Works, Radford, Virginia.

Professor Wells married Bettie Jo Thomas of Radford, Virginia, May 13, 1944. Their children are Emily Jo 11, John Thomas 9, and Grace Marie 6. His hobbies are photography, electronics, and gardening.

Several years ago Dr. Wells reorganized the Elementary School Science Section of the Virginia Education Association and served two years as its president. He is a member of the Advisory Board of the Virginia Academy of Science and was a member of the recent State of Virginia workshop set up to develop a Guide in Science Grades one through twelve for the State Department of Education.

Professor Wells is a member of the National Association for Research in Science Teaching, Association for the Education of Teachers in Science, American Association for the Advancement of Science, Virginia Academy of Science, Virginia Education Association, National Science Teachers Association, Phi Kappa Tau, Phi Delta Kappa, and Kappa Delta Pi.

CLARENCE M. PRUITT

A REPORT OF THE THIRTY-SEVENTH ANNUAL MEETING OF THE ASSOCIATION FOR THE EDUCATION OF TEACHERS IN SCIENCE

WILLARD J. JACOBSON
Teachers College, Columbia University, New York, New York

AND

LAWRENCE PUGNO
San Jose State College, San Jose, California

THE Thirty-seventh annual meeting of the Association for the Education of Teachers in Science was held at Rutgers University and at Teachers College, Columbia University, November 1–3, 1956. In this report of the meeting we are including a short, general description of the meetings; a digest of the remarks made by President John Wells at the close of the last session; a selective summary and interpretation of the discussion sessions of the meeting by Lawrence Pugno; a digest of talk delivered by Werner Braun of the Rutgers Institute of Microbiology; and, the minutes of the annual business meeting.

GENERAL DESCRIPTION OF THE MEETINGS

At the meetings, the members of the Association centered their attention on three related themes. The discussions the first day were on the theme, *Science Manpower Problems and the Science Teacher.* The introductory remarks, which spelled out the problems in terms of the science teacher, were given by Professor Hubert Evans. In the afternoon, a panel headed by Professor F. L. Fitzpatrick highlighted some of the steps that are being taken to meet the problem. Professor George Z. F. Bereday placed the problem in an international context with his address, *American and Soviet Scientific Potential.*

One of the highlights of this year's meeting was the Friday session at Rutgers University arranged by Professor Ned Bryan. The feature of the morning session was the address, *Recent Advances in Bacterial Genetics* given by Professor Werner Braun

of the Institute of Microbiology. A short resume of his talk is included in this report. Later, in the morning we had a chance to see the modern laboratory facilities available at the institute of Microbiology. In the afternoon, we visited the New Brunswick plant of E. R. Squibb and Sons. In their plant, we saw the industrial application of the advances made in microbiology. Throughout the afternoon we had a chance to discuss these advances and the implications of these developments for science education with some of their top technicians and scientists. Many of us will long remember the striking demonstration of the relaxing effect of curare on a hapless rabbit.

Saturday morning, Trygve Jensen discussed new developments in atomic energy and gave a number of suggestions for methods and materials of teaching in this area. Professor Jensen stressed the fact that this is a very dynamic field of scientific endeavor; it is difficult to keep abreast of developments in this area and this poses a real problem for the teacher of science. Professor Jensen suggested a number of sources of information to which the science teacher can turn to get information about recent developments in this area.

Franklyn Branley, Associate Astronomer at the American Museum-Hayden Planetarium, reported on *Operation Vanguard: The Earth Satellite*. Operation Vanguard is one of the projects being undertaken in conjunction with the other activities of the International Geophysical year. Mr. Branley showed a new filmstrip and gave suggestions on how to explain the earth satellite to children.

THE PRESIDENT'S SUMMARY OF THE MEETINGS [1]

I believe it is important that we pause before returning to our work at our various schools and colleges to consider some aspects of the conference in the context of our own educational situations.

In fact, it seems to me appropriate for each of us to ask ourselves this question. "How has this Association meeting helped me professionally?"

At this point, if I were a good teacher, I would ask the group to react to the above question. We might write the suggestions on the chalkboard and see what the group works out. The results I am sure would be interesting.

(Note: At this point President Wells did just this, and the members of the Association present reacted to and discussed their experiences of the preceding three days.)

However, in this report, I will follow the traditional pattern and give a brief summary of some of my reactions to the conference. I will state these reactions as answers to the question, "How has this Association meeting helped me professionally?"

In the first place, the conference provided me with new information about scientific and technical subjects.

While several of the speakers gave much new scientific information, the lecture by Dr. Braum was especially significant to me as a non-biologist. It clarified a body of information I have long neglected. I thought the trip to the Squibb Laboratories was a very suitable follow-up for the morning lectures.

Secondly, we had the opportunity to sit with others of kindred interest and reaffirm our goals for science teaching and identify certain new goals. Some of the goals of science education seem enduring like the goal, helping people to understand the physical and biological environment; yet, other goals seem to be shifting in importance. A case in point is the goal of encouraging students to become scientists. Two decades ago, this was scarcely recognized as a goal. Now we hear much discussion on the subject.

The third way this meeting helped me professionally, was by giving me the oppor-

[1] A summary of the remarks made by Professor John Wells of Madison College, President of the Association for the Education of Teachers in Science.

tunity to think through some important issues of science education. Many issues were brought up specifically by the speakers. Others follow naturally from discussions.

One issue important to me was in the area of instruction. Am I justified in attempting to use an inductive approach from a problem solving situation even though much less subject matter can be covered? Another issue developed concerned the responsibility of the science teacher to train scientists. Must the science teacher accept the main responsibility for the supply of scientists, or should he devote more of his energies to training people in general to appreciate and utilize science?

Another phase of science teacher supply is also apparent. Should standards be lowered at the State Certification level with the hope of enticing more people into science teaching; or, are there other ways to resolve the dilemma? What is the value of the National Science Foundation Summer Institutes and other programs designed to promote science education?

What are the trends in curriculum development in science? Is the trend to eliminate physics at the high school level justified, even if some other physical science is offered in its place? Some suggest that the high school science teacher's job is strictly general education in science. These people further explain that the high school teacher's job is primarily to develop interests and attitudes favorable to sciences—not to provide high school students with college science background material.

Finally, a real professional value for me of this meeting was the "afterclass" meetings and contracts. In these sessions, we frequently found that, in the small conversational groups, problems were discussed and viewpoints aired which were as important as the lectures and discussions of the formal meetings. We talked about our own problems at our own institutions and listened to our colleague's problems. Group participation was high and the values to all were apparent.

And with these few words, I believe it is time to adjourn for another year.

SUMMARY AND INTERPRETATION OF DISCUSSION SESSIONS[2]

Certainly, the most constant underlying theme of the discussions was the present shortage of scientific manpower—and the discussants were asking and providing partial answers to such questions as:

What is the exact nature of the scientific manpower shortage?

(a) What forces and conditions brought it on?

(b) Will these forces and conditions be with us in the future?

(c) Is the shortage in semi-skilled or the highly-skilled technicians or in the creative researcher? Or, is there a shortage of all such personnel?

What is the role of the following persons and agencies in overcoming the shortage?

(a) Elementary and high school teachers.

(b) Teachers colleges.

(c) Liberal arts colleges.

In my opinion, some of the important suggestions made to help alleviate the scientific manpower problem were that:

Industry and school systems can help by checking to be sure that they are using their own manpower to the maximum. The potential of manpower is not being reached when:

(a) Teachers are called upon to do non-essential tasks.

(b) Professionally trained teachers and highly specialized technicians or scientists are called upon to do tasks that can be handled as well by the untrained. Science teachers can be more effective if they are provided with laboratory assistants and other teacher personnel aids.

Teachers colleges can help by determin-

[2] These observations and interpretations were made by Professor Lawrence Pugno of San Jose State College, San Jose, California.

ing, organizing, and putting into operation programs for equipping the scientifically trained persons from liberal arts colleges, armed forces, and industry, that so desire, to become effective teachers of science.

Science teachers at all levels of education can help by making sure they are making their courses interesting and effective. It is incredible that the most vital of content areas, science, is typed by many students as being the most deadly. Some steps to take are:

(a) Make science courses functional—both for the layman and the future specialist in science.

(b) Bring courses up to date. Deal with the frontiers of science—atomic research, space travel, electronics, bio-chemistry, etc.

RECENT ADVANCES IN BACTERIAL GENETICS [3]

During the last 10 years bacterial genetics has become one of the fastest growing fields in biology and has made highly significant contributions to basic problems of genetics, microbiology, cellular differentiation, epidemiology, and biochemistry. The demonstration that genetic and biosynthetic processes in microorganisms are essentially similar to those of higher organisms has provided investigators with test organisms (bacteria) that, (1) multiply rapidly (e. g. generation time of Escherichia coli = 18 min.), (2) attain large population sizes (e. g. 10^9 cells per ml), (3) can be subjected easily to a variety of environmental influences, and (4) are amenable to detailed biochemical analyses. Unique processes of transfer of hereditary determinants between cells, akin to a sexual process, have been discovered in several bacterial species. So-called transformation involves the cell to cell transfer of "naked" DNA molecules, transduction involves transfer of "genes" via bacteriophage, and in certain species chromosome-like pieces appear to migrate from one cell to another following a type of conjugation. These mechanisms provided an opportunity for breeding experiments among bacteria which have resulted in the finding that genetically active intranuclear regions ("genes") are far smaller than previously suspected. Numerous types of mutants (spontaneously arising, stable varients) resistant to usually adverse conditions (e. g. antibiotics), or with specific nutritional requirements (e. g. histidine) have been studied and have contributed to an understanding of the biochemical basis of resistance and suceptibility and to the recognition of intermediate steps in biosynthesis. Such mutant strains also provided ideal material for the experimental study of population genetics; this subject has contributed much novel information regarding the nature and function of inherent and environmental factors affecting population changes.

[3] This is a digest of the talk given by Professor Werner Braun of the Rutgers Institute of Microbiology at the Friday morning session of the Association.

THE BUSINESS MEETING

The following are officers and members of the Executive Committee for the coming year:

President: Robert Wickware, Willimantic State Teachers College
President-Elect: June Lewis, New York State University Teachers College at Plattsburg
Vice President: East, George Zimmer, New York State University Teacher College at Fredonia
Secretary-Treasurer: Willard Jacobson, Teachers College, Columbia University
Executive Committee:
F. L. Fitzpatrick, Teachers College, Columbia University
Frank X. Sutman, Paterson State Teachers College
John Wells, Madison College

The Spring meeting of the Association was held at Trenton State Teachers College, Trenton, New Jersey, May 3 and 4, 1957.

The annual Fall meeting of the Association for 1957 will be held at Teachers College, Columbia University on October 31, November 1 and 2. It was suggested that a portion of this meeting be devoted to a

consideration of "The Foundations of Science Education." Material such as I. Bernard Cohen's *Science—Servant of Man* might be considered. A discussion of science in both the elementary and secondary schools could be related to this theme. Again, one meeting should be devoted to the "Frontiers of Science." It was suggested that one of the following three field trips be included: Brookhaven, Lamont Geological Laboratories, or some of the research laboratories on the Columbia campus.

The Association was invited to hold its Spring 1958 meeting on the campus of Madison College at Harrisonburg, Virginia.

The following institutions were represented at the thirty-seventh annual meeting:

Board of Education, New York City; State Teachers College, Cheney, Pa.; City College; Coppin State Teachers College, Baltimore, Md.; Public Schools, Great Neck, N. Y.; Ministry of Education, Japan; Hayden Planetarium, New York City; Public School, Half Hollow Hills, N. Y.; Illinois State Normal University, Normal, Ill.; Jersey City Junior College; Institute of Education, Afghanistan; Madison College, Harrisonburg, Va.; Department of Education, Maryland; Newark College of Engineering; Montclair State Teachers College; New Haven State Teachers College; New Paltz State Teachers College; New York University; Paterson State Teachers College; Rutgers University; Fredonia State Teachers College; Teachers College, Columbia University; Temple University; Public Schools, West Orange, N. J.; State Teachers College, E. Stroudsburg, Pa.; Trenton State Teachers College; State Teachers College, Westfield, Mass.; Teachers College, Johnson, Vt.; Connecticut State Teachers College, New Britain; Wagner College; Wheelock College; Teachers College, Washington, D. C.

THIRTY-SEVENTH ANNUAL MEETING OF THE ASSOCIATION FOR THE EDUCATION OF TEACHERS IN SCIENCE

NOVEMBER 1–3

Teachers College, Columbia University, and Rutgers University

THEMES

November 1: "Science Manpower Problems and the Science Teacher"

November 2: "New Developments In the Biological Sciences"

November 3: "Providing Educational Experiences On the Frontiers of Science"

OFFICERS

President: John Wells, Madison College
President-elect: Robert Wickware, Willimantic State Teachers College
Vice President-East: June Lewis, New York State Teachers College at Plattsburg
Vice President-Midwest: Silvan Mikelson, Ohio State University
Secretary-Treasurer: Willard Jacobson, Teachers College

EXECUTIVE COMMITTEE

Ned Bryan, Rutgers University; F. L. Fitzpatrick, Teachers College; Robert Wickware, Willimantic State Teachers College; Prevo Whitacre, Indiana University

THURSDAY, NOVEMBER 1

At Teachers College, Columbia University, New York City, Room 256 Thompson Hall

"SCIENCE MANPOWER PROBLEMS AND THE SCIENCE TEACHER"

Presiding—PROFESSOR JOHN WELLS, Madison College and President of the Association for the Education of Teachers in Science

9:00–10 A.M. Registration and Coffee Hour

10:00–10:15 "Welcome," Professor F. L. Fitzpatrick, Head of the Department of Science, T.C. Columbia University

10:15 "Science Manpower Problems and the Science Teacher," Professor Hubert Evans, T.C. Columbia University

Conference Discussion of Problem

12:00 Lunch-Cafeteria
"American and Soviet Scientific Potential," Professor George Z. F. Bereday, T.C. Columbia University
2:00 "Science Education and the Manpower Problem," Panel presentation and discussion
4:30 Meeting of the Executive Committee and Association Officers

FRIDAY, NOVEMBER 2
At Rutgers University, New Brunswick, New Jersey

"NEW DEVELOPMENTS IN THE BIOLOGICAL SCIENCES"

Presiding—Professor NED BRYAN, School of Education, Rutgers University and Past President of the Association for the Education of Teachers in Science.

9:30–10:00 Registration and Coffee—In Conference Room 4th Floor Institute of Microbiology
10:00–11:30 Lecture Hall, Institute of Microbiology
"Welcome to Rutgers," Dean Henry C. Herge, School of Education
"Welcome to the Institute of Microbiology," Professor Selman Waksman, Director of the Institute of Microbiology
"Recent Developments in Microbial Genetics," Professor Werner Braun, Institute of Microbiology
11:30–12:15 Tour of the Institute of Microbiology
12:30–1:15 Lunch. University Commons, Room E
1:30–3:30 "Microbiology in Industry," Visit to the E. R. Squibb and Sons, New Brunswick Plant
4:00–5:00 Campus Visits. Start from University Commons Lounge
6:30 Dinner. University Commons, Room D
Business Meeting
"Science Education and Technical Assistance; Professor Willard J. Jacobson, T.C. Columbia University

SATURDAY, NOVEMBER 3
At Teachers College, Columbia University, New York City, Room 256 Thompson Hall

"PROVIDING EDUCATIONAL EXPERIENCES ON THE FRONTIERS OF SCIENCE"

Presiding—PROFESSOR JOHN WELLS, President of the Association for the Education of Teachers in Science

9:00 "Operation Vanguard. The Earth Satellite," Franklyn Branley, Associate Astronomer, The American Museum—Hayden Planetarium
"The Energy of the Atom," Professor J. Trygve Jensen, Wagner College
11:00 "Summary and Comments by the President of the Association," Professor John Wells
12:30 Association Luncheon. Teachers College Cafeteria

ASSOCIATION FOR THE EDUCATION OF TEACHERS IN SCIENCE *

PRACTICALLY no information in written form—secretary notes, programs, or mimeographed material—is available relating to the early history of the organization. Possibly some participants at these earlier meetings may have some material such as programs, filed away. Seemingly Dean James Earl Russell proposed such a conference to Professor S. Ralph Powers who then initiated the first conference about 1930. (See article written by Professor Powers in March 1950 News Notes published below.) Professor W. L. Eikenberry was probably the first chairman. Other earlier participants were: E. Lawrence Palmer, Earl R. Glenn, O. E. Underhill, Otis W. Caldwell, Victor Crowell, Gerald S. Craig, R. J. Slay, Sylvia Griswold, John Johnson, Elwood Heiss, and Lois Meier Shoemaker.

In 1953 the Conference on the Education of Teachers in Science voted to change its name to the Association for the Education of Teachers in Science.

A list of officers since 1946 is published below.

* The assemblage of most of the material in this article is due to the efforts of Laurence Pugno, Illinois State Normal University, Normal, Illinois.

OFFICERS OF THE ASSOCIATION FOR THE EDUCATION OF TEACHERS IN SCIENCE

Nov. 15–16, 1946

Chairman: Dr. Victor Crowell, State Teachers College, Trenton, N. J.

Vice Chairman: Dr. Dwight Sollberger, State Teachers College Indiana, Pa.

Secretary-Treasurer: Dr. Alice M. Williams, State Teachers College, Potsdam, N. Y.

Nov. 14–15, 1947

President: Ellis Haworth, Wilson Teachers College, Washington, D. C.

Secretary-Treasurer: Dr. Alice M. Williams, State Teachers College, Potsdam, N. Y.

Nov. 19–20, 1948

President: Dr. Emmett Brown, State Teachers College, Buffalo, N. Y.

Secretary: Dr. Theresa Lammers, State Teachers College, Westfield, Mass.

Treasurer: Dr. Richard Lampkin, State Teachers College, Montclair, N. J.

Nov. 18–19, 1949

President: John Read, Boston University

Vice-President: J. Darrell Barnard, New York University

Secretary: Theresa J. Lammers, State Teachers College, Westfield, Mass.

Treasurer: Richard Lampkin, State Teachers College, Montclair, N. J.

Executive Committee: Fletcher Watson, Harvard University; H. Emmett Brown, State Teachers College, Buffalo, N. Y.; Frederick L. Fitzpatrick, Teachers College, Columbia.

Nov. 3, 1950

President: George Haupt, Glassboro, N. J.

1st Vice-President: Robert Cooper, Muncie, Ind. (to automatically become president for the fall, 1951 meeting)

2nd Vice-President: Rose Lammel, N. Y. (to automatically become president for the spring 1952 meeting)

Recording Secretary: Betty Tyson, Willimantic, Conn., also Elizabeth Feeney (in recognition of services)

Secretary of Publications: Theresa J. Lammers, Westfield, Mass.

Treasurer: Robert G. Williamson, Washington, D. C.

Executive Committee: Fletcher Watson, Boston, Mass.; F. L. Fitzpatrick, Teachers College, Columbia; John Read, Boston, Mass.; Mary Hutton, Salisbury, Md.; Robert Wickware, Willimantic, Conn.

May 1–3, 1952

Vice-President, Midwest Section: G. P. Cahoon, Ohio State University

Vice-President, Southern Section: Professor Jerome Kuderna, Alabama Polytechnic Institute

Vice-President, Eastern Section: Professor Katherine Hill, New York University

Permanent Secretary-Treasurer: Willard Jacobson, Teachers College, Columbia University

Nov. 13–15, 1952

President, Eastern Section: Professor Katherine Hill, New York University

Executive Committee: Professor Victor Crowell

(In the May 1952 meeting the executive committee was reconstituted as follows: One permanent Teachers College representative, the President, Vice-President, and Secretary-Treasurer. An elected representative from each of the three regional sections.)

Permanent Secretary-Treasurer: Willard Jacobson, Teachers College, Columbia University

Oct. 29–31, 1953

President: G. P. Cahoon, Ohio State University

Executive Committee, Eastern Representative; Robert Wickware, Willimantic, Conn.

Permanent Secretary-Treasurer: Willard Jacobson, Teachers College, Columbia University

May 3, 1954

Vice-President, Eastern Section: Harold Tannenbaum, New Paltz, N. Y.

The Association's Executive Board: G. P. Cahoon, Ohio State University, President; Harold Tannenbaum, New Paltz, V. President of Eastern Section; P. L. Whitaker, Indiana University, V. President of Western Section; Willard Jacobson, Permanent Secretary-Treasurer: F. L. Fitzpatrick, Member of the Board; Robert Wickware, Willimantic, Member of the Board.

April 9, 1954

President: G. P. Cahoon, Ohio State University

Vice-President, Midwest: Dorothy Matala, Iowa State Teachers College

Vice-President (2nd), Midwest: Leonard Winier, Iowa State Teachers College

Vice-President, Eastern: Harold Tannenbaum, New Paltz, N. Y.

Nov. 5, 1954

President: Ned Bryan, Rutgers University

Vice-President, Eastern: Dr. June Lewis, Plattsburg, N. Y.

Permanent Secretary-Treasurer: Willard Jacobson

Nov. 5, 1955

President: Dr. John Wells, Madison College
President (elect): Robert Wickware, Willimantic Connecticut
Vice President, Midwest: Silvan Mickelson, Ohio State University
Executive Committee, Member: Dr. Prevo Whitacre, Indiana University
Vice-President, Eastern: Dr. June Lewis, Plattsburg, N. Y.
Permanent Secretary-Treasurer: Willard Jacobson

Nov. 2, 1956

President: Robert Wickware, Willimantic, Conn.
President (elect): June Lewis, Plattsburg, N. Y.
Vice-President, Eastern: George Zimmer, Fredona, N. Y.
Permanent Secretary-Treasurer: Willard Jacobson
Executive Committee: John Wells, Madison College; Frank X. Sutman, Paterson S.T.C., F. L. Fitzpatrick, Teachers College, Columbia

PROGRAM PRESENTED AT THE TWELFTH CONFERENCE, APRIL 29 and 30, 1938

"In the Education of Teachers in Science What is the Place of Survey Courses?" C. E. Power, State Teachers College, Albany
"In the Education of Teachers in Science What is the Place of Specialized Courses?" Charles E. Hadley, State Teachers College, Montclair, N. J.
"Evaluation of Courses—Teacher Education" Lois M. Shoemaker, State Teachers College, Trenton, New Jersey
"What Preparation in the Natural Sciences Should Be Required of Teachers Who Do Not Plan To Teach in the Science Field?" William C. Bagley, Teachers College, Columbia University
"The Place of the Laboratory in the Elementary School and in the Education of Teachers" Martin L. Robertson, New York University
"The Place of the Laboratory in the Training of Teachers for Elementary Science," R. A. Waldron, State Teachers College, Slippery Rock, Pa.
"Laboratories to Meet the Needs of Prospective Teachers of Science in Senior High School," Victor H. Noll
"Laboratories for Institutions of Teacher Education," W. L. Eikenberry, State Teachers College, Trenton, N. J.
"Is Science Still Remaking the World?" Otis W. Caldwell, Boyce Thompson Institute, Yonkers, N. Y.
"What Do Directors of Elementary Schools Expect of Subject Matter Specialists?" Mae Kelly, Bedford County Public Schools, Bedford, Va.
"The Place of the Laboratory School in the Education of Teachers in Science," Florence B. Stratemeyer, Teachers College, Columbia University
"In Service Education of Teachers—as the Young Teacher Sees the Problem," John D. Sugarbaker, Ramsey, N. J.

CONFERENCE ON THE EDUCATION OF TEACHERS IN SCIENCE
MARCH 10, 1950

NEWS NOTES

. . . Write these dates on your calendar *now!!!*

April 21 and *22,* Friday and Saturday: The Conference will be held at Boston at the invitation of Harvard and Boston University
November 1–4, Wednesday, Thursday, Friday and Saturday: The Conference will be held at Teachers College, Columbia University, New York City

INFORMATION

The 26th Conference in Boston, April 21 and 22: Professor John Reed, Boston University, and Professor Fletcher Watson of Harvard University are developing the program for the two-day conference.

One of the features will be a trip to some of the outstanding elementary and high schools, and teacher education institutions in the Boston area.

There will be a discussion at the Harvard Faculty Club by Jasper F. Kraus, formerly Dean, University of Maine, on the topic "What is a good teacher of science?"

Discussions will be held on "What can a good science teacher do?" Other topics to be considered are: "Demonstrations," "Shop," "A–V aids," Camping and outdoor experience," "Youth organization service." Dean Durrell of Boston University will speak on "Reading problems in science teaching."

The Hotel Commander, Cambridge, Massachusetts, has been recommended by Dr. Read; *reservations should be made at once.*

When program plans are completed, copies of the program will be mailed.

The 27th Conference in New York, November 1–4:

At the business meeting of the 25th Conference which was held November 18th in the Men's Faculty Club, Columbia University, it was agreed

that the 27th Conference should be extended to a *four-day study conference on the education of teachers in science.* The Friday and Saturday meeting of the conference would serve the needs of teachers concerned with pre-service and in-service problems for public schools as heretofore. Professors Rose Lammel, Darrell Barnard, Robert Wickware, Elwood Heiss, and Gerald Craig were appointed members of the committee to develop a program for the workshop and the conference. It has been proposed that the theme of this conference be "Science Education for Democracy."

Reports of Discussion Groups of the 25th Conference held at Teachers College, November 1949. Professor Theresa Lammers was appointed chairman of the publication committee. With the help of the recorders—Julian Greenlee, Elizabeth Feeney, Ned Bryan, and Foster Arthur—she has prepared reports of the discussion groups of the 25th Conference. This report will be published in the April 1950 issue of Science Education. Reprints will be distributed to the paid membership of the Conference. If you wish additional reprints kindly apply, stating number, to G. S. Craig, Teachers College, for advance orders. These will be distributed at actual cost as long as the supply lasts.

The new officers are: President, John Read; Vice President, J. Darrell Barnard; Secretary, Theresa J. Lammers; Treasurer, Richard Lampkin; Executive Committee, Fletcher Watson, H. Emmett Brown, Frederick L. Fitzpatrick

BE SURE TO CLIP THE MEMBERSHIP FORM FROM THE LAST PAGE AND SEND IT TO DR. LAMPKIN

* * *

At the Business Meeting of the Twenty-Fifth Conference on the Education of Teachers in Science, held at Teachers College, Columbia University, New York on November 18 and 19, 1949, the following motion was presented and passed by unanimous vote:

> that a committee of five, headed by Professor Powers, undertake to effectuate a more formal type of organization for this conference group, especially as concerns some form of statement as to the nature and purpose of the organization.

A committee was named consisting of: H. Emmett Brown, Ellis Haworth, John G. Read, Robert Wickware, S. Ralph Powers, Chairman.

Following is the report of this Committee:

The Teachers College Conference on the Education of Teachers in Science.

The Teachers College Conference on the Education of Teachers in Science began as a small discussion group of heads of departments of science in normal schools and teachers colleges. These men came together on invitation of the Dean of Teachers College, Columbia University.

The minutes of these earlier discussions have been lost but it was probably during the autumn of 1930 that plans were made to continue them and to enlist larger participation. Announcements were addressed to the presidents of nearby teachers colleges and with each announcement an invitation was sent to a member of the science department. No limit was fixed on the number of invitations to be sent. Geographic location furnished the principal criterion for making selections. A few went to more distant colleges. These were generally in response to inquiries that had come from individuals who had learned of the earlier meetings and had expressed an interest in them. Some invitations were sent to city and state supervisors of this same region. There was a generous response followed by a large attendance. This meeting, although it came following several smaller ones, may for purposes of reference be called the first meeting of this Conference.

Growing out of the experience of this larger conference came the suggestion to extend the Conference to two meetings each year, one to be held at Teachers College during the Fall semester and one at some other college during the Spring. In support of the Spring meeting it was said that it would afford opportunity for observation of facilities and for first-hand study of curriculum planning as it was done in the college to be visited. As an illustration, an early meeting in a Pennsylvania college furnished opportunity for study of a new state plan for teacher education and an opportunity for observation and study of the manner in which the particular college was adopting its work in the teaching of science to the new plan. Representatives from the State Department of Education met with the Conference and took an active part. At another time the Conference met at a college in New Jersey on the occasion of the opening of a new science building. Here, there was opportunity to see how the staff of the college had translated its curriculum plans into the structure of the building and to learn first-hand the problems to be met in such an important undertaking. These and similar meetings proved to be extremely rewarding and, consequently, it was accepted as general policy that the Spring meetings should be continued, that they should be held in a college where work in progress was of greatest interest, and that the first responsibility for the planning should rest with the faculty of the college at which the Conference would meet.

In general the staff of the Science Department of Teachers College has assumed first responsibility for the meetings held during the Fall semester. As the Conference has grown this responsibility has, more and more, been shared with others. The discussions have been centered on broad current issues of policy in teacher education that seemed particularly pertinent in their implications for teacher-education in science. In part as a result of these discussions, individuals and groups within the Conference have exercised

strong leadership in two important trends: (a) in extending and in determining the quality and content of education in science for children in elementary schools and at the same time for young people who are educating themselves for work as elementary school teachers; and (b) in giving direction to plans for education in science for young people in high schools that will be more nearly in agreement with current interpretations of needs and, at the same time, in giving direction to teacher education in science for those who are to work in high schools as science teachers. In furthering these two important trends attention has been centered on the relations of school and community and on the responsibilities of the teacher who has been educated in science, to help in interpreting the community and in choosing courses of action for dealing with community problems. This has led to increased emphasis on field studies for both elementary and secondary school teachers. Other centers of interest have been in methods for the study of children with reference to their growth and development and to processes in learning, and in methods of group planning and of group action. Professors in science education in other graduate schools located in the region of this Teachers College Conference have contributed richly to the discussions and in other ways to the advancement of the Conference. Professors in other areas than science, for the most part members of the staff in Teachers College, have also assisted and have contributed to discussions in special areas in ways that have been most helpful. These two annual meetings, one during Fall and one during Spring, have provided favorable opportunities to study both theory and practice in the education of teachers in science.

Three main purposes that have guided in planning the Conference activities may be identified. Specifically the purposes have been to provide opportunities for teachers with common interests (1) to study, discuss and evaluate current plans and policies for teacher education; (2) to evaluate their own work in relation to the work of others in similar colleges and to initiate changes; (3) to challenge each other to take active part in the deliberations of the Conference, to keep abreast of developments and to exert leadership in advancing teacher education in science. In furthering these general purposes, which in the main seem both clear and valid, the influence of the Conference has been more than local. Its activities have gained the recognition of educators in other regions than the one in which these co-operating schools are located.

Accordingly it is suggested that:

1. The Conference shall be continued following plans similar to those that have in the past guided its activities.

2. There shall be continuing and closer co-operation among interested teachers in furthering the accepted purposes.

3. This report shall be distributed as a memorandum of information to the presidents, deans, and to heads of science departments in the teachers colleges in the New England and Middle Atlantic States.

4. Those who receive this memorandum shall be invited to suggest other purposes, to help in accomplishing more effectively the three main purposes already stated, and to co-operate in other ways in accordance with their own interests.

Finally, it is suggested that additional steps shall be taken to bring the work of this regional Conference to the attention of science educators in other regions and, as a means to this end, it is suggested that a summary of the deliberations to be carried on in future meetings shall be published in an appropriate educational journal.

H. Emmett Brown
Ellis Haworth
John G. Read
Robert Wickware
S. Ralph Powers,
Chairman

AN ERUPTING VOLCANO

Mrs. Annie J. Colbert
Killeen East Ward Elementary School, Killeen, Texas

MATERIALS NEEDED

1. Large piece of strong press board, veneer, or table top, 48 to 54 inches square, with small retaining rail (Z).

2. Piece of ½ in. sheetrock about 16 in. square (E).

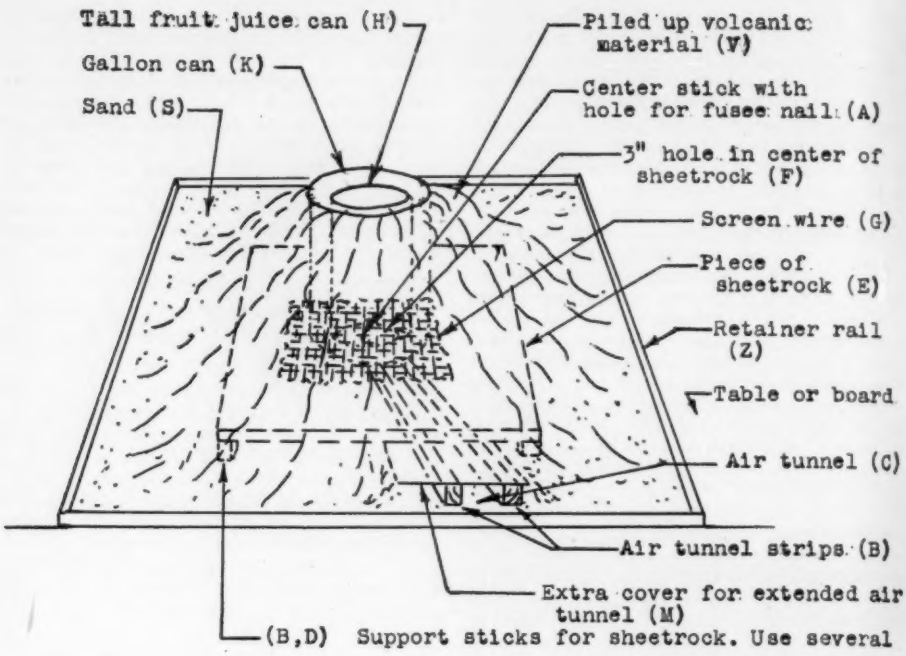
3. Six or 8 strips of wood to serve as blocking (B and D) under sheetrock to raise it from table top.

4. Sand to cover table top about ½ inch deep (S).

5. Tall fruitjuice can (46 oz.) (H) with top and bottom cut out.

6. Gallon can (K) with top and bottom out. (Get from lunch room).

7. *Thick* soap suds made of DREFT colored dark red with dry powder tempera or thick mixed tempera, or fruit color.



8. Japanese Incense, 25¢, 3 or 4 lbs. dry ice, 10¢ lb., water.

9. Several fusees such as are used by railroads, buses, and the army. They are about 8 inches long. Don't use the real long ones.

10. Dry rock and cinders. I borrowed it from the highway department. They use a gray crushed chats that looks like volcanic material.

11. Scraps of screen wire about 6-8 in. in diameter, or square. (G)

DIRECTIONS

Cover the table top with about ½ inch of sand. In the center of the table lay strip (A) which has a hole in the center into which you can wedge the nail of the fusee to make the fusee stand up.

2. Leading out from about center, lay 2 strips (B) so that they leave an opening about 2 in. wide which will serve as an air tunnel. (C), (B, D)

3. Place remaining sticks in positions to support sheetrock, (E).

4. Cut out a 3-inch hole (F) in center of sheetrock with pocketknife. Place sheetrock (E) on strips (B and D).

5. Lay screen wire (G) over hole.

6. Place fruit juice can (H) over wire-covered hole with strip (A) centered underneath on sand.

7. Place gallon can (K) on outside of can (H). Center cans and fill space between with small crushed rock.

8. Place small piece of stiff board (M) over extended top of Tunnel sticks (B) at (C) to prevent tunnel from being closed.

9. Pile volcanic material (V) crushed rock, cinders, black dust, etc. all around cans building it up to completely cover the rim of the gallon can, but not letting it fall into the center can. Let the material make a *gradual* slope to tabletop sand.

10. Pour streaks of either dry tempera powder or thick tempera paint down sides of volcano to simulate lava flows.

ERUPTIONS

1. Wedge small piece of screen wire lightly inside center can (H) about 1 in. below top. Light several cones of Japanese incense and lay on wire. Let burn out. It sends up a thin column of smoke and gives off the unusual odor of incense that simulates volcanic odors. Your volcano is beginning to come to life.

2. Remove incense wire. Insert a No. 2 can (with bottom in) inside center can. Drop in several pieces of dry ice. Pour in plain water until white smoke boils over edges of volcano. This looks like steam. Your volcano is about to erupt.

3. Empty water and used dry ice from N. 2 can and replace can. Put in more dry ice. Pour in thick red soup suds on dry ice and stir vigorously with stick. Bubbles of red lava will pour out over volcano. Large bubbles will burst and shoot out a stream of white steam or smoke very much like Old Faithful Geyser in Yellowstone. Your volcano is pouring out molten rock or lava. A real volcano does not usually pour out lava until the fire eruptions have decreased in violence.

Caution: Pour this soap in sparingly at first to test or you will have soap bubbles all over everywhere!!!

4. Remove N. 2 can. Remove the wrapping from the fusee* by pulling up and over on the cloth tab on one side. Twist cap and lift off, exposing black top of fusee. The outside top of the cap has a striking surface like a match box. Place fusee inside center can pushing nail down through wire into center hole of block (A) underneath screen. Wedge tightly so fusee will stand erect. Holding fusee between index and 2nd finger with palm of hand

* Fusees may be ordered from: Lakeside Railway Fusee Co., Beloit, Wis. Adults only may order.

down, strike top of fusee with striking surface of cap with a hard rub. The fusee will light. It will burn at least 5 minutes. The material of the fusee will pop and sputter out with a very realistic effect.

Caution: Be sure to have the room well ventilated as the burning fusee gives off a sulphurous sort of gas that may make you cough or your eyes sting. If in a large room or gymnasium, ordinary ventilation is sufficient.

Allow time for fusee residue to cool before trying to remove. It can be scattered about over the volcano.

Your volcano is finally putting on a real show and it smells like it, too.

BOOK REVIEWS

HUBLER, CLARK. *Working with Children in Science.* Boston (2 Park Street): Houghton Mifflin Company, 1957. 425 P. $5.50.

Working with Children in Science is designed for teachers and prospective teachers in the elementary and junior high school. The book contains numerous practical suggestions for classroom procedures to aid the student teacher and, if kept at hand as a source of reference, should continue to be helpful in the classroom for many years. Administrators, supervisors, and consultants interested in promoting science programs will find this an excellent reference.

The practical day-to-day science teaching needs of teachers and pupils are stressed. Children of various age levels and learning experiences are provided with a wealth of information and learning activities.

The procedures recommended are simple yet sound. First-hand experiences are stressed throughout, motivated by the child's natural curiosity about the world in which he lives.

Based upon accepted research findings in the teaching of elementary science as well as the author's extensive experience as a teacher in the field, working both with children and elementary teachers, the content, philosophy and psychological approach are completely up to date. Illustrations are authentic, many derived from the author's own experiences.

The first half of the book is concerned with the purposes, philosophy, methods, and activities in teaching elementary teacher. This content has been selected from each of the various broad areas of science. This content should be readily within the comprehension of most elementary teachers.

Some 105 photographs and illustrations supplement the textual material. At the end of each chapter is a study guide.

There is a bibliography of selected science books for children, arranged under designated science areas. There is also a brief list of publications for teachers.

This is an excellent book for all teachers of elementary science and junior high school science. Teachers with little or no science content background as well as more experienced teachers will find this an excellent book to have—even if they now have some other professional book on elementary science at hand. The book should have great appeal to prospective and classroom teachers of elementary science for many years to come. See this issue of *Science Education* for information about the noted author of this outstanding elementary science publication.

TERRIEN, SAMUEL. *Lands of the Bible.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. 97 P. $3.95.

Lands of the Bible is a Golden Historical Atlas. It is the fully illustrated story of Palestine, Egypt, and the Middle East from Old and New Testament times to the present. There are more than 100 photographs and illustrations with relief maps in color.

The Atlas starts with the early civilizations along the river valleys of Mesopotamia and Egypt—possibly as early as 4500 B.C. Then came Noah's sons—Ham, Shem, and Jopheth—the Ark and the story of the Flood, and the Tower of Babel. From here on the story is on much more factual evidence, beginning with the Patriarchs of the Bible: Abraham, Isaac, Jacob, and Joseph dating back to about 2000 B.C.

The story and history of the Bible is then traced in story, maps, and illustrations as the Hebrews wandered about Egypt, Palestine, and the Middle East. One gets a much more vivid picture of the story unfolded in the Bible as one reads the story of the activities of the various Biblical characters. Both names and places become more real.

This is an unusually fine reference to those persons having some interest in the Bible and Bible Lands, either religiously, historically, or geographically.

The author is Auburn Professor of Old Testament in the Union Theological Seminary.

PHILLIPS, J. B. *The Book of Revelation.* New York (60 Fifth Avenue): The Macmillan Company, 1957. 50 P. $2.00.

Readers will remember with great pleasure the previous books of Rev. Phillips: *Your*

God Is Too Small, Appointment with God, Making Men Whole, The Church Under the Cross, New Testament Christianity, Plain Christianity, The Gospels, Letters to Young Churches, and the *Young Church in Action.*

The Book of Revelation completes the New Testament translations by J. B. Phillips. In these translations he writes as the Evangelists would have if they had been addressing people like us. The Rev. R. J. McCracken, Riverside Church in New York City says of Rev. Phillips, "He writes with extraordinary freshness and interprets the Christian Faith in convincing and challenging fashion."

Putting the Book of Revelation in easy to read translation and still retain the mystery, symbolism and beauty was a challenging problem admits the author. But followers of the author will readily agree he has done a most remarkable job. Read it, compare, and judge for yourself! In our opinion Rev. Phillips is one of the world's finest religious writers.

PHILLIPS, J. B. *The Church Under the Cross.* New York (60 Fifth Avenue): The Macmillan Company, 1956. 111 P. $2.50.

The very essence of the spirit of Global Missions is the Cross. The book is a sort of prototype of the kind of report that St. Paul might have written about his experiences with the young church.

The author believes that the bearing of the Cross is far from being a matter of static patient faithfulness. He avoids any sentimental dodging of issues and explains Jesus' concern for the mind as well as for the heart. The reader will see that sympathetic action at home is as vital as service on the frontier for accepting the weight of the Cross. Too often we are willing to substitute a manufactured Cross for the Real Cross.

As always Reverend Phillips writes thoughtfully, penetratingly, and challengingly. So *The Church Under the Cross* becomes another of his outstanding books on religion in the Atomic Age.

MASANI, SHAKUNTALA. *Gantama.* New York (60 Fifth Avenue): The Macmillan Company, 1956. 119 P. $1.50.

Buddha, Gantama is supposed to have lived about 563–483 B.C. The term Buddha means the "enlightened one who enlightens" or "the awakened one who awakens the sense of truth in his fellow men." Buddhism is conceived of as the possession of perfect wisdom and supernatural powers. According to Buddhist doctrine, there is a line of Buddhas who apepar in the course of human history from the time of remote antiquity to the distant future. Buddhism is the living faith in Ceylon, Japan, China, Indo-China, Siam, Burma, and Tibet. In India where Buddha and Buddhism were born, Buddhism has been all but extinct since 1200 A.D.

According to the story developed in *Gantama* two thousand and five hundred years ago was born a Prince who renounced his throne and the world and preached the Divine Law. His name and His teachings still endure. The man is Lord Buddha whose followers today in southeast Asia are numbered by the millions. This is the story of how Buddha came to earth, lived among men, and departed from this world into a state of endless peace and joy which is Nirvana.

This story of Buddha has many elements of similarity to the life of Jesus. Yet there are many strange and startling differences, too. The reason for many of the beliefs and activities of Buddhists become clear when one reads this story so little known by the Christian and western world.

BAUER, W. W., AND DUKELOW, DONALD A. *What You Should Know About Smoking and Drinking.* Chicago (57 West Grand Avenue): Science Research Associates, Inc., 1955. 40 P. $0.50.

This a Junior Life Adjustment Booklet written by two prominent physicians, Dr. Bauer being Director of the American Medical Association's Bureau of Public Health and Dr. Dukelow the Bureau's Consultant in Health and Fitness. The booklet for the most part is written in a conversational style carried on by a group of young boys and girls. They try to present the facts about smoking and the use of alcohol. They conclude: All doctors agree that smoking is harmful to boys and girls. Alcohol doesn't injure the body directly but dulls the brain and leads to highway accidents and other misfortunes such as divorce and unemployment.

Tobacco contains the following poisons in small amounts: nicotine, tar, ammonia, formaldehyde, hydrogen sulfide, hydrogen cyanide, carbon monoxide, and arsenic.

The material in the pamphlet is presented in a fashion that will probably appeal to young people.

MCGRADY, PAT. *Cigarettes-Lung Cancer?* New York (22 East 38th Street): Public Affairs Pamphlets, 1955. 28 P. $0.25.

Along with the recent and present Salk vaccine controversy, the cigarette-lung controversy has been as sharp and will be the more prolonged. This pamphlet surveys the present status of this controversy.

Mr. McGrady, the author, is a former newspaperman and is Science Editor of the American Cancer Society. However, the views he expresses in this pamphlet do not necessarily represent the official views of the Society.

Cancer of the respiratory track will kill about 26,000 Americans this year, tuberculosis 25,000 persons, diabetes about 25,000, suicides and homicides 25,000, as compared to 26,000 in three years of Korean fighting.

The most striking thing about lung cancer is its increase among men—both its incidence and its mortality. Among American men lung cancer deaths rose from .7 per 100,000 population in 1914 to 3.6 in 1930 to 19.5 in 1950. Only 6 per cent of deaths from lung cancer occur in men under 45 and only 8 per cent for women of all ages. About twice as many urban dwellers are affected as rural dwellers. Lung cancer is now fatal in 95 out of 100 cases.

What are the reasons for the above increased rate of lung cancer? It is not known now for sure but cigarettes are strongly suspected. Tar fumes, automobile exhaust, dust from road surfaces and rubber tires, arsenic, nickel carbonil, soot and fumes from oil furnaces, chromates, coal furnace smoke, and radioactive dust are possible causes. By the age of 80, lung cancer will have claimed 6 of every 1,000 non-smokers, 25 of 1,000 half-a-pack-a-day smokers, 49 of 1,000 pack-a-day smokers, and 80 of 1,000 who smoke more than a pack a day.

The statistics for those dying of heart disease are quite comparable to those dying of lung cancer. Seemingly, it takes from 20 to 30 years for latent lung-cancer to appear after one begins to smoke. Only more recently have women become smokers of cigarettes to a large extent. A survey twenty years ago showed 61 per cent of men smoked cigarettes and only 17 per cent of the women. In 1953, it was found 68 per cent of the men smoked cigarettes and 43 per cent of the women.

The large tobacco companies have appropriated more than a million dollars for the study of lung cancer. With other interested groups and individuals studying the same problem, a more accurate assessment of the relation between cigarette smoking and lung cancer (and heart disease, too) may be forthcoming.

CRAIG, GERALD S. AND URBAN, JOHN. *Facing Tomorrow with Science.* Boston (Statler Building): Ginn and Company, 1956. 359 P. $2.96.

Facing Tomorrow with Science is the ninth and final title in the famous Craig *Science Today and Tomorrow Series.* The other titles have been reviewed previously in *Science Education.* This, as are the other titles, is a most attractive book in every way and should have high pupil and teacher appeal. The illustrations in color are unusually fine—the best you will find in any elementary science textbook. The reviewer thought the colored illustrations in physiology were unusually apt and attractive. The content has been mostly carefully selected and within the comprehension of grade eight boys and girls. At the end of each chapter are learning activities *Exploring Your Knowledge of Science, Using Science in Your Life,* and *Learning by Experimenting.*

A Teacher's Manual is available for each book in the series.

CRAIG, GERALD S., AREY, CHARLES K., AND SHECKLES, MARY E. *Learning with Science.* Boston (Statler Building): Ginn and Company, 1956. 400 P. $2.96.

This is the seventh grade book of the Craig elementary science series *Science Today and Tomorrow.* Naturally it complements the lower grade titles which have been reviewed in *Science Education.* A readable literary style utilizes carefully selected science content to make this an outstanding seventh grade science book. Interesting, pertinent, attractive illustrations and photographs in color and black and white supplement the textual material. Pupils who are fortunate enough to have this book as a basal science book will have an opportunity to learn a lot of science during the school year. A Teacher's Manual is being prepared for use with the textbook.

DOWLING, THOMAS J., FREEMAN, KENNETH, LACY, NAN, AND TIPPETT, JAMES S. *The New Seeing Why, The New Learning Why, The New Explaining Why, The New Discovery Why, The New Understanding Why.* Philadelphia (1010 Arch Street): The John C. Winston Company, 1956. 124 P., 184 P., 315 P., and 380 P.

The above six titles are new editions of the very popular and widely used *Winston Understanding Science* series first published in 1951. The reviewer considered the earlier titles an unusually fine elementary science series and the above six titles continue the earlier outstanding characteristics.

The books are most attractive in format and will have high appeal to both pupils and teachers. Interesting science content, well selected vocabulary, and appealing pictures in color combine to make these unusually fine elementary science books. At the end of chapters of the higher level books are pertinent questions, a true-false test, words to explain, review facts, and things to do.

The above titles respectively are for the first six grades. Two other titles will shortly follow.

SMITH, VICTOR C. AND CLARKE, KATHERINE. *Science Along the Way, Science Under the Sun, Science Around the Clock;* SMITH, VICTOR C., AND HENDERSON, BARBARA, *Science Across the Land, Science Through the Seasons,* and *Science Beneath the Skies.* Chicago: J. B. Lippincott, Company, 1956. 128 P., 160 P., 160 P., 224 P., 352 P., and 352 P.

The above titles are the *Lippincott Elementary Science Series* from Grade One through Grade Six. Altogether this is a most attractive series and completes the Lippincott pre-college series of outstanding textbooks.

The elementary science series are abundantly illustrated, all in attractive color. The content has been carefully selected and especial attention has been paid to readability and word difficulty. The literary style is often conversational.

The first three grades has a list of things to do and things to think about. The last three grades in addition to these two activities has a list of things to remember and a list of experiments to do.

Mr. W. R. Teeters, Director of Education for the St. Louis Public Schools, served as consultant for the entire series. Mr. Victor R. Smith teaches science in the Ramsey Junior High School Minneapolis, Minnesota. Miss Katherine Clarke teaches in the Meramec School, Clayton, Missouri. Miss Barbara Henderson is Director of Intermediate Education, Kansas City Public Schools, Kansas City, Missouri.

This series should appeal to both the children reading the books and the teachers using them. Consequently it is most likely the series will have long and extensive use.

WHIPPLE, GERTRUDE, AND JAMES, PRESTON E. *Our Earth; Using Our Earth; Our Changing Earth; Living on Our Earth; At Home on Our Earth; Neighbors on Earth; Our Earth and Man.* New York (60 Fifth Avenue): The Macmillan Company, 1954, 1955. 245 P., 296 P., 318 P., 253 P., 346 P., 412 P. respectfully. $2.80, $3.12, $3.12, $3.48, $3.72, $3.72, $3.88 respectfully.

This series of geography textbooks for the elementary grades is the second edition of the series first published in 1948 and now brought completely up to date. The books are listed in order of difficulty or grade placement.

The series aim (1) to develop in the child a real interest in geography, through dealing with him on his own level of comprehension; (2) to develop the child's ability to think geographically and to interpret intelligently the landscape and man's activities in various regions about which he hears and reads; and (3) to provide an easy and explicit approach to the mastery of maps.

The books are replete with numerous, well-selected photographs and illustrations, many in color. The maps are unusually fine. The subject matter is informative, with especial attention to literary style, readability, and vocabulary. Map study is emphasized at the higher levels. There are many fine suggestions made for students using the various texts.

Altogether this is an outstanding series of texts in geography—readable, interesting, challenging, teachable. The authors are noted educators. Miss Whipple is supervisor of reading in the Detroit, Michigan, Public Schools and Professor of Education in Wayne State University. Dr. James is Professor of Geography at Syracuse University, Syracuse, New York.

Our Earth, the first book, is presented in story form, stories about mountains and activities of people who live on them; hilly lands, the plains, the lakes, the river and the sea. The last two sections are about the earth we live on and how we get food, clothing and shelter. All photographs and illustrations are in color.

Using Our Earth is the second book of the series. Again all illustrations and photographs are in color. Major sections are: The Earth On Which We Live; Salmon Fishing in Early Times and Today; How Men Have Changed Pasture Lands; How We Came to Have Blue-Grass Farms; Making a Woodland into Farm Land; Changing a Desert to Orchard Land; Making Roads Across Our Land; How a Railroad Changed a Town; How the Land Has Been Changed; The World We Live In.

Our Changing Earth may be used as a one-book text instead of the first two volumes described above. Much of the content is the same but not all.

Living on Our Earth assumes some knowledge of facts and principles presented in the books above. The first part of the book describes the lives of a number of typical people: Canoe People, Eskimoes of Greenland, Reindeer People, Navajo Indians, Forest Indians, Farmers of the Nile Valley, and Rice Farmers of China. Other following sections are; Gaining a Living From Our Earth, Pineapple Farming in the Hawaiian Islands, Mountain Villages in Switzerland, St. Louis a Great City.

At Home on Our Earth deals with the United States and the British Commonwealth.

Neighbors on Earth Concentrates on Latin America and Mediterranean countries—again because of the common heritage of the peoples discussed.

Our Earth and Man may precede *Neighbors on Earth* as a text if preferred. This book devotes considerable space to the Soviet Union, followed by western Europe, central Europe, the middle East, southeast Asia, China, Japan, Korea, Indonesia and the Philippines. Then follows sections on raw materials, manufacturing, conservation, and problems of world population.

CRAIG, GERALD S., BRYON, BERNICE C., DANIEL, ETHELEEN, LEMBACH, MARGUERITE W., HURLEY, BEATRICE DAVIS, HILL, KATHERINE E., ROCHE, RUTH LIPENBERGER, AND NAVARRA, JOHN GABRIEL. *Teachers' Manual for Science for You.* (7 volumes.) Boston (Statler Building): Ginn and Company, $1.48 each.

These Teachers' Manuals—one for each grade level—are designed to accompany the following Craig *Science Today and Tomorrow* series—primer, first grade, second grade, third grade, fourth grade, fifth grade, sixth grade, and seventh grade books. These books should be very helpful to elementary teachers using anyone or all of the Craig series of elementary science books. Having the textbook available and the specific teacher's manual for this book, any elementary teacher ought to be able to do a creditable if not a fine job of teaching elementary science. Certainly a lot of thinking and planning have gone into the efforts to make these books as useful and practicable as possible for the elementary teacher.

The general plan for each manual is similar. Suggestions are quite specific, relating to the content found in the text-overview of main topic, science meanings to be developed, science information for the teacher, ways of working with children, materials and equipment, experiences and activities, evaluation, books for children and teachers, films, and film strips.

Probably more thought, effort, and planning went into developing these outstanding Teachers' Manuals than into writing the textbooks for which they are intended. In and by themselves the manuals should be a wonderful aid to improving classroom teaching of elementary science.

CHARTERS, W. W., SMILEY, DEAN F., AND STRANG, RUTH M. *Health Secrets, Healthful Ways, Let's Be Healthy, Habits Healthful and Safe, Growing Up Healthily,* and *A Sound Body.* New York (60 Fifth Avenue): The Macmillan Company, 1955. 230 P., 246 P., 275 P., 280 P., 302 P., and 341 P. respectfully. $1.76, $1.76, $1.96, $1.96, $2.16, and $2.16 respectfully.

The above titles of *Your Health and Growth Series* is a revision of a series first published in 1941. Many people agree that teaching of health in the public schools is in need of greater emphasis. For some reason American Children do not measure up to physical health standards that should be readily attainable. No one seems to know exactly the reasons for this lack of attainment. With excellent books as this series is, with many sources of information available, with fairly adequate health facilities available and with teachers having had what should be adequate college programs of health education, for some reason many children do not measure up to desirable standards of physical fitness.

This series of books should most adequately take care of the desirable available textbook aspect. The books are excellent by many standards. An excellent corps of writers and educators have written the series. The subject matter is well selected, written quite interestingly, and challengingly. Vocabulary pupil-learning activities, readability, and teachability aspects are all most adequate.

Health Secrets is for grade three. The book centers around the activities of third graders from the time they get up in the morning until they go to bed at night.

Healthful Ways is for grade four. Activities of fourth graders including vacation periods are the focus of attention.

Let's Be Healthy is the fifth grade book. Sportmanship, safe play, first aid, food, menus, eating habits, digestion, looking one's best, and care of eyes, ears, nose, throat, and teeth are emphasized.

Habits Healthful and Safe is the sixth grade book. Working out things for One's Self, Winning Friends, Getting Along with Grown-Ups, Buying One's Clothes, Bacteria, Medicine, Food Problems, and Community Problems are emphasized.

Growing Up Healthily, the seventh grade book, emphasizes: the adventure of growing up, needs of the body, protection against disease, personal appearance, and safety.

A Sound Body is the eighth grade book. The operation of the body—digestion, circulation, respiratory system, hearing, seeing, posture, and muscular control are emphasized.

ROSS, HELEN. *The Shy Child.* New York (22 East 38th Street): Public Affairs Pamphlets, 1956. 28 P. $.25.

Many children are shy and they can be helped by their parents and teachers. Shyness is made, not born. It stems largely from the nature of the child's upbringing and the kind of experiences that come his way. Parents should not expect too much nor expect too little from a child. Not all shy people are unhappy misfits.

Shyness is a kind of fear, not of something defined and frightening, but rather of something unseen and foreboding of something that *may* happen. Some shyness is the result of physical or emotional discomfort or a combination of the two. Physical frailty, ill health, or a dread disease can make a child shy.

This is a fine pamphlet for parents and teachers who have or deal with shy children.

THURBER, WALTER A. *Exploring Science One, Exploring Science Two, Exploring Science Three, Exploring Science Four, Exploring Science Five,* and *Exploring Science Six.* Boston (41 Mount Vernon Street): Allyn and Bacon, 1955. 160 and 93 P.; 176 and 96 P.; 192 and 110 P.; 224 and 119 P.; 320 and 157 P.; 352 and 143 P. $1.72, $1.88, $2.00, $2.16, $2.24, and $2.40 respectfully.

The above titles are the Teacher's Edition of the new Allyn and Bacon Elementary Science series *Exploring Science.* The Teacher's Editions contain the materials given in the pupil's editions plus expert, detailed suggestions for using the material—teaching "know-how's" such as how to provide time for science, how to present material, how to answer pupil questions, and so on.

Exploring Science is based on many of years of teaching elementary science to teachers and pupils by the author. Dr. Thurber is Professor of Science at Cortland State Teachers College, Cortland, New York. Several hundred teachers have tested the material in actual classroom practice, activity by activity, testing, discarding, adding new materials, and experiments.

Exploring Science is a "doing" science—full of purposeful, meaning activities, experiments, and countless field trip suggestions. Pupils are performers, not spectators. Low-cost experiments are used in the experiments. There are numerous illustrations in color that have a very specific purpose in relation to teaching the subject-matter, yet in themselves are interesting and stimulating to the children. The vocabulary has been most carefully checked.

Altogether this is a most attractive elementary science series that will have both strong teacher and pupil appeal, insuring extensive and long usuage. In future years many pupils will be led into science careers because they first had contact with this outstanding series of books.

WALCH, J. WESTON. *Successful School Discipline.* Portland, Maine (Box 1975): J. $3.00.

In two years *Successful School Discipline* has gone through three editions. It contains 530 ideas that have worked in elementary and high school discipline. Contributions include teachers, guidance directors, and principals. Over 2,000 persons were asked to indicate their best methods in the field of school discipline—methods that really worked for them. The book is carefully indexed.

Since discipline is an important problem in most schools and with many teachers, no wonder this book has proved so popular.

Partial contents include: What we mean by successful discipline, Desirable aims and goals in modern school discipline, Some interesting comments on the cause of school disciplinary problems, Practical ideas for avoiding discipline problems, Advantageous plans for handling general discipline problems, Ideas for handling specific classroom discipline problems, and Ideas for handling schoolwide discipline problems.

PATTON, DAVID, AND JOHNSON, ELEANOR M. *Spelling for Word Mastery.* Grade 2, 3, 4, 5, 6, 7, and 8 respectfully. Columbus, Ohio (Education Center): Charles E. Merrill Books, 1956. 128 P. each $1.20 each (class orders, $.90 each).

Spelling books have undergone a metamorphosis since the days of Webster's Blue-book spelling books and even the grade-school days of the reviewer! Spelling books are now attractive! At least this series is very attractive in format, the use of color, and illustrations.

Spelling for Word Mastery should make learning to spell a refreshing experience. The books in a very real sense combine reading, phonics, writing, language exercises, and usuage. There are pupil and teacher suggestions and helps galore.

Phonetic elements, word-analysis skills, dictionary use, English skills, and practice in spelling difficulties are carefully planned and repeated at each grade level. New words are introduced and practiced meaningfully. There is a constant emphasis on word and thought meaning.

An excellent Teachers Manual is available for each grade-level book.

Pupils using this series of books should become good spellers, better readers, improved handwriters and effective users of the dictionary, and acquire the dictionary habit.

SEIPT, IRENE SCHUNO. *Your Child's Happiness.* New York: World Publishing Company, 1955. 254 P. $3.00.

The credo of the author of this book is: "Letting your child develop as naturally and easily as possible in an atmosphere of love is the best way yet discovered to secure for your child his right to happiness in childhood." The book is a sane, practical guide for parents (and teachers) in non-medical language, void of psychoanalytical jargon.

Rearing children in a home is a great responsibility-one too often shirked or at best partially avoided. Problems of juvenile delinquency in the main go back to home conditions. One or botn parents do not assume the responsibility that only they can really assume. There are many, many reasons for this: ignorance, impatience, thoughtlessness, lack of time, drinking, counter attractions, being unwanted, selfishness, and so on. Real love would solve most of the problems relating to children in the home.

Your Child's Happiness is designed as a practical guide to those parents having problems in rearing their children. (And what parents do not?). Teachers, too, will find this book most interesting and practical.

HAGMAN, HARLAN L. *Administration of Elementary Schools.* New York (330 West 42nd Street): McGraw-Hill Book Company, 1956. 356 P. $5.00.

The book is intended for mature students of elementary education whose intention is to prepare for careers as administrators of elementary schools. Experience as a school principal or as a teacher in elementary schools would be helpful.

The book discusses purpose, planning, organization, and authority. After the introductory chapter which gives an overview of the whole book, the chapters may be read or studied in any order. Each chapter is introduced by a list of questions pertinent to the subject matter of that chapter.

The book seemingly covers about every aspect of elementary school administration. The stress is on broad principles rather than practical details. Altogether this seems to be a very good book on the general problems of elementary school administration. The reviewer is sure that there are thousands of elementary school principals who could profit greatly from having a copy of this book.

VAN RIPER, CHARLES, AND BUTLER, KATHERINE. *Speech in the Elementary Classroom.* New York (49 East 33rd Street): Harper and Brothers, 1956. 182 P. $2.50.

The text is not concerned with the speech of the teacher or with college speech activities "watered down" for children. It is wholly concerned with the child's own speech problems on his own level and is devoted to basic skills

and communications. The book is concerned with speech improvement for all children—not only those with speech defects. The book is crammed with useful techniques and detailed lessons, developed with fascinating ingenuity. There are numerous amusing illustrations.

There are chapters on teaching and talking, speech improvement time, the alphabet of sound, self-hearing and vocal phonics, improving fluency, thinking aloud, the improvement of voice, speech as a safety valve for emotions, and helping children with speech defects.

Professor Ripper is Director of the Speech Clinic at Western Michigan State College, Kalamazoo, and Miss Butler is Speech Therapist in the Kalamazoo Public Schools.

HATCHETT, ETHEL L., AND HUGHES, DONALD H. *Teaching Language Arts in Elementary Schools.* New York (15 East 26th Street): The Ronald Press Company, 1956. 426 P. $4.75.

This book is designed as both a textbook for prospective teachers and to serve as a guide for supervisors, administrators, and teachers in service. It aims to provide the background for an effective language arts program and give concrete suggestions for the improvement of teaching methods. The functional-creative approach is stressed.

Elementary teachers will find this a valuable book for improving the effectiveness of their language arts program.

HESTER, KATHLEEN B. *Teaching Every Child to Read.* New York (49 East 33rd Street): Harper and Brothers, 1955. 416 P. $4.00.

Teaching Every Child to Read suggests an ambitious goal and ideal. Yet basically that should be the purpose of every elementary school teacher and the achievement of every entering elementary pupil. Not every elementary teacher has this ideal and far too many boys and girls never learn to read—at least effectively for their grade level.

Classroom teachers and administrators should welcome this fine book that stresses the practical and the concrete rather than the theoretical. The latter is stressed, too, by implication. The book bridges the gap between research findings and actual classroom procedures.

There are 23 chapters divided into five major divisions: Part I, The Teacher Studies Reading; Part II, The Teacher Studies the Pupils; Part III, The Teacher Plans an Effective Reading Program; Part IV, The Teacher Improves the Instruction; Part V, The Teacher Evaluates the Reading Program.

Dr. Kathleen B. Hester is a teacher and supervisor with a rich, wide, and varied experience in the elementary classroom. For a number of years she was Professor of Elementary Education at the University of Miami, Coral Gables, Florida. Presently she holds the same position at Michigan State Normal School, Ypsilanti, Michigan.

MCEATHRON, MARGARET. *Your Child Can Learn to Read.* New York: Grosset and Dunlap, 1956. 92 P.

This book is intended for parents and teachers who want to help their children to read. There are 40 step-by-step lessons fully illustrated. The book uses combined *Phonetics* and *Sight* methods.

The book is planned to help introduce children to phonics in an enjoyable way, know how children learn to read, know when children learn to read, and understand and solve individual reading problems.

FLESCH, RUDOLF. *Teaching Johnny to Read.* New York: Grosset and Dunlap, 1956. 72 P.

Dr. Rudolf Flesch, noted educator and reading consultant, recently created a nation-wide sensation in his *Why Johnny Can't Read.* In it he explained why today's schools are turning out a large number of children who cannot read properly.

Dr. Flesch says the answer to this problem is *Phonics*—learning to read by sounding out each letter. As the child learns new sounds, he will be able to read words, then whole sentences.

There are more than 70 exercises in this book designed for school or help-at-home training. Parents can use the book effectively. Not all reading experts approve this method, but a great many do.

THE COMMISSION ON THE ENGLISH CURRICULUM OF THE NATIONAL COUNCIL OF TEACHERS OF ENGLISH. *Language Arts for Today's Children.* New York (35 West 32nd Street): Appleton-Century-Crofts, Inc., 1954. 431 P. $4.75.

Language Arts for Today's Children is Volume II in the five volume series of books being prepared by the National Council of English Teachers. Volume I, *The English Language Arts* has been reviewed previously in *Science Education.* Altogether the five volume series comprises the most notable comprehensive series of books in the English Language Arts, covering all of the levels from kindergarten through college. It is truly a notable work. Many individuals contributed to the material in this volume. Volume II is divided into four parts. Part I sets forth the sources from which any effective program in the language arts must stem—the needs for language among children living in the world today. Part II treats separately each of the four strands of the language arts program—listening, speaking, reading, and writing. Part III brings the four phases of language into functional relationships both among themselves and with the on-going experiences of classroom living. Part IV deals with basic considerations in setting up and appraising a sound language arts program.

Science teachers can gain much by reading and assimilating some of the philosophy, psychology, methods, and techniques set forth in this volume.

CARTER, HOVER L. J., AND MCGINNIS, DOROTHY J. *Learning to Read.* New York (330 West 42nd Street): McGraw-Hill Book Company. 214 P.

This is a handbook for teachers and is intended to provide definite, specific, and practical suggestions for the improvement of reading at all levels. Brevity is one of the book's outstanding characteristics.

Part one considers some reading problems and why they develop. Part Two is concerned with reading objectives and materials for their accomplishment. Part Three discusses developmental and therapeutic procedures every teacher can use.

Nearly fifty pages of the book lists specific books with indicated grade levels for developing word recognition and vocabulary, correcting specific reading errors, stimulating an interest in reading activities, increasing comprehension and rate of reading, and developing work-study habits.

YOAKUM, GERALD A. *Basal Reading Instruction.* New York (330 West 42nd Street): McGraw-Hill Book Company, 1955. 357 P.

In the preface the author states "After thirty-five years of effort to teach teachers how to teach reading to children, the author feels that the time has come for him to set down as clearly as possible what seem to him the basic procedures involved in the process. It is his hope that in doing so he will make some contribution to the improvement of reading instruction in the schools in America." Thus this book is devoted to the development of this thesis.

Basic aims, facts, skills, principles, and abilities essential to an understanding of modern reading instruction are developed in Part I. Basal abilities essential to good reading of all kinds is considered in Part II. Suggestions of how the basal reading program may be extended to all fields are discussed in Part III. In the Appendix is found a rather conprehensive discussion of the Yoakum Readability Formula together with forms for its use.

MULAC, MARGARET E. *Fun and Games.* New York (49 East 33rd Street): Harper & Brothers, 1956. 329 P. $3.95.

Here are hundreds of fun ideas and games for children and adults, at home, at school, at camp or at all kinds of club meetings. Brought together are games and entertainment for every occasion.

All sorts of games are included—some old, some new. There are singing games, folk games, card tricks, guessing games, party games, carnivals, fun treasures—for all age levels. The book is completely indexed.

The book is especially recommended for grade teachers and recreation teachers. The author is a professionally trained recreational leader of many years experience.

KAUFFMAN, CAROLYN AND FARRELL, PATRICIA. *If You Live with Little Children.* New York (210 Madison Avenue): G. P. Putnam's Sons, 1957. 145 P. $2.95.

If You Live with Little Children is a collection of ideas for having fun with preschool children. The book is partly based on a questionnaire study of parents of small children. Some ideas are old and some ideas are brand-new. There are literally hundreds and hundreds of ideas, with many, many, illustrations.

There are suggestions for out-doors, indoors, rainy-days, going to the doctor, getting a haircut, when company comes, nature and science, money, baby sitters, bed-time, bath time, birthdays, special days, and so on.

This is an unusually suggestive book for kindergarten and first-grade teachers, or even second and third grade teachers. Many a teacher and parent will especially appreciate the many children activities described. The philosophy of the authors is most commendable: children are to be *enjoyed* and *loved.* This book will help teachers to better enjoy and love children, too!

SRA. *Achievement Series. Form A 4–6.* Chicago (57 West Grand Avenue): Science Research Associates.

This Achievement Series tests measures four basic skills: Work-Study Skills, Reading, Language Arts, and Arithmetic. The test is intended for Intermediate grades. An Examiner's Manual accompanies the test. This gives general instructions, directions, directions for administering the test, directions for scoring the test, grade equivalent norms and percentile norms.

FENNER, PHYLLIS. *The Proof of the Pudding.* New York (210 Madison Avenue): The John Day Company, Inc., 1957. 246 P. $3.95.

The Proof of the Pudding tells what children read. Miss Fenner was librarian in the noted Manhasset Long Island, Public Schools, for thirty-two years, from 1923 to 1955.

This is a book for parents, the librarian, and all school teachers. It was written to tell what books children like to read and why, to suggest how children can be encouraged to read even more, and to recommend hundreds of specific books for various groups and types of readers.

The first four chapters consider: Bringing Children and Books Together, What Children Like, What Books Can Do for Us and The Need of Background for Reading. Then follows fourteen chapters on various types of books,

with brief annotations on the numerous books mentioned. The titles of all books annotated are listed alphabetically in the index.

Books are grouped as follows: Picture Books, Folk and Fairy Stories, Funny Stories, Adventure Stories, Animal Stories, Quiet Stories, For Ladies Only, Fact Books, Books for Non-readers, Poetry Books, The Classics, Stories to Read and Tell, Books For A Home Library, and The Three E's.

This book deserves extensive and long usage. It is a handy reference to have around.

MARTIGNONI, MARGARET E. *The Illustrated Treasury of Children's Literature.* New York: Grosset and Dunlap, 1956. 512 P. $4.95.

Some of the finest and most treasured children's literature—poetry and prose—are found in this unusually attractive book. It is illustrated with the original pictures by 85 world famous artists. Time-tested favorites from much of the world's popular children's books have been assembled in this single volume. There are 49 famous stories, 20 fables and legends, a complete picture of A B C's, 44 best loved fairy tales, 50 mother goose rhymes, and 79 favorite childhood poems. There are 550 colorful illustrations.

This is a fine book for children of all grade levels, for elementary teachers, for parents to read to children, and for grown-ups who enjoy reading the classics they once enjoyed long ago.

VOLRATH, J. P. *Animals in School.* London, England (Fifty Albermarle Street): John Murray, 1956. 144 P. 12s. 6d.

This English guide to the care and management of animals in classrooms would be as useful to American elementary and secondary science teachers as to their English compatriots. Details of management, feeding, breeding, diseases of various animals which are suitable for keeping in school and home are given.

There are 45 photographs and 7 line diagrams. This is an excellent guide book for elementary science, junior high school, and secondary science teachers.

MEREDITH, FLORENCE L., IRVIN, LESLIE W., AND STRATON, WESLEY M., *Health and Fitness.* Boston (285 Columbus Avenue): D. C. Heath and Company, 1957. 450 P. $4.20.

This third edition has been almost completely rewritten by Professors Irwin and Straton. Research has produced many new facts, new concepts and improved techniques since the publication of the second edition.

The unusual popularity of the earlier editions will be enhanced by this most attractive high school text. The superb pictures and illustrations, the challenging, readable text material should appeal to all high school youngsters. Many of them would welcome an opportunity to read the book on their own, if not used in school as a text.

Health and Fitness is recommended as an excellent reference for biology students and teachers and for elementary science teachers.

JONES, EVELYN G. *Enjoying Health.* Chicago (333 East Lake Street): J. B. Lippincott Company, 1956. 434 P.

Enjoying Health is the second edition of a secondary text based on the findings of the Denver study of health interests of children. The high interests in high school are attractive appearance and physical fitness. As in the junior high school book, *doing* is emphasized as the integral part of class activity.

Each chapter has a Picture Preview which will be useful for stimulating interest and planning. Each chapter ends with a well designed series of test materials, suggested reading, and a list of filmstrips and moving pictures. Excellent photographs and illustrations supplement the textual material. Elementary, general science, and biology teachers will find this an excellent supplementary text.

WILLIAMS, DOROTHEA M. *Building Health.* Chicago (333 East Lake Street): J. B. Lippincott Company, 1956. 431 P.

This is the second edition of a junior high school level book that is a most attractive book in format, the numerous and excellent illustrations and photographs, pupil aids to study, challenging content, and readability.

The book emphasizes *doing* activities which will appeal to junior high youngsters. The practical approach will be appreciated by classroom teachers.

This book is recommended as a fine book on health for general science, elementary school, and biology teachers. Many individuals will enjoy reading the book as a part of their cultural reading.

PEARL, RICHARD M. *How to Know the Rocks and Minerals.* New York (330 West 42nd Street): McGraw-Hill Book Company, 1955. 192 P. $3.50.

This is a practical, basic field guide to more than 125 of the most important minerals and rocks, including gems, ores, native metals, and meteorites. It is written for the beginner and amateur collector. It features basic, step-by-step methods by which any collector can quickly and easily identify typical specimens and some of the more rare and unusual ones as well.

Outstanding is Professor Pearl's *Four Keys to Recognizing Rocks* and *Seven Keys to Recognizing Minerals.* No special equipment or skill is needed. A full page is devoted to each rock or mineral. There is a drawing of the specimen and a full, yet brief, description of its chemical contents, uses, historical origins, and geographic location. This is an excellent book for the elementary school teacher or the beginner who desires to learn how to know and identify the more common rocks and minerals.

HAUSMAN, LEON AUGUSTUS. *The Bird Book.* New York (480 Lexington Avenue): Arco Publishing Company, 1955. 159 P. $2.50.

The Bird Book is an illustrated guide to North American bird life. There are 362 bird illustrations, 16 pages of 17 birds in full color. There are 59 bird families represented and there are pictures of one member of each family. For each bird illustrated there is a descriptive paragraph giving its scientific and popular names, its distinguishng characteristics, its habitat and favorite locales.

Dr. Hausman is professor of zoology and ornithology at Rutgers University and a noted authority on birds and nature subjects. He taught at Cornell University for many years.

This is a recommended guide book for all teachers and students interested in the study of birds. Elementary science teachers, general science, and high school biology teachers will find this an unusually fine guide—and very reasonably priced, considering the numerous photographs and color plates. In the classroom, it would serve as a handy reference for pupils.

WING, LEONARD W. *Natural History of Birds.* New York (15 East 26th Street): The Ronald Press Company, 1956. 539 P. $6.75.

Natural History of Birds is a comprehensive coverage of every aspect of bird life. The book is characterized by readability, thoroughness and accuracy. It is abundantly illustrated (222 in all).

Birds are depicted as they are in nature—their adaptations, origins, evolution, distribution, and abundance. Bird anatomy is discussed in detail. There are chapters on bird adaptations, plumage, age and sex in the bird, ecological relations, social relations and social behavior, bird flight, bird migration, bird song, courtship and nesting habits, care of young, heredity, food habits, and so on.

If you want specific information about a certain bird, e.g., Robin, Mockingbird, here's a place to find it. It is an excellent book to read as such, but it will serve as a reference over the years.

Here's a fine reference for elementary teachers and biology teachers and for the science book shelf. Upper grade and biology students can use it as a reference.

LEHR, PAUL E., BURNETT, R. WILL, AND ZIM, HERBERT S. *Weather.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. 160 P. $1.00.

This is the latest *Golden Nature Guide.* Of all aspects of the natural world, weather is outstanding in its beauty, its majesty, its terrors, and its continual direct effect on man. This is a guide to weather phenomena and forecasts. There are 301 illustrations in full color by Harry McNaught. Contents include: What Makes the Weather?, Rain, Snow, Dew, Frost; The Atmosphere-Restless Ocean of Air; The Earth's Motions and Weather; Air Masses; Fronts and Frontal Weather; Storms; Weather Forecasting; Weather Maps; Weather and Climate; and Books for More Information.

This book is recommended as a fine weather guide and reference for elementary science and general science teachers and all persons interested in a compact accurate guide on weather.

ZIM, HERBERT S., AND SHOEMAKER, HURST S. *Fishes.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 160 P. $1.00.

This is one of the famous Zim Golden Nature Guides. Previous guides were on: Birds, Flowers, Insects, Stars, Trees, Reptiles and Amphibians, Mammals, and Seashores.

This guide describes both fresh-and salt-water species. There are estimated to be some 30,000 species of fishes, some 4,000 being found in North American waters. Florida records some 100 fresh- and 600 salt-water species; southern California about 400. There is introductory material about kinds and distribution of fish, adaptations, parts of fishes, internal structures, migrations, fishing, conservation, collecting and studying fish. Fossilized fish bones have been found in rocks 400,000,000 years ago and the Devonian Period of 350,000,000 years ago is known as the age of Fishes.

The authors group the fishes into certain groups because of certain characteristics. Illustrated in color by James Gordon Irving, there is brief descriptive material about 278 species.

This book is recommended as an excellent guide for elementary science teachers, general science and biology teachers, and all persons interested in a brief accurate, practical guide in the study of fishes.

PARKER, BERTHA MORRIS. *The Golden Book of Science.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 97 P. $3.95.

This is as attractive book in science as one can possibly find. It serves as a fine introduction to earth, sea, sky, air, plants, animals, man, and his inventions. It is suitable for any grade level from the first through high school and for adults as well. It is one of the finest books that could be added to the science or school library, presented as a gift, or to possess individually.

The illustrations in color by Harry McNaught, Research Associate in the Chicago Natural History Museum, are an integral part of the book. Miss Parker is a well known writer of materials for children and teachers in the elementary school. She formerly taught in the Laboratory Schools of the University of Chicago and is a member of the National Association for Research in Science Teaching.

The science content is well and broadly selected and is intriguingly illustrated. A few of the

topics and areas described are: How Old Is Old? How Big Is Big? How Fast Is Fast? How Far Is Far? How Hot Is Hot? Insect Cities, Copycats, Fossils, Grand Canyon, Old Faithful, Mountains That Smoke, Stars, Magnets, Sound, Wonders to Come, and so on.

This book is one the famous Simon and Schuster *Giant Golden Books.*

DAVIS, HELEN MILES. *Science Exhibits.* Washington, D. C. (1719 N Street, NW): Science Service, 1955. 96 P. $2.00.

Science Exhibits is a fine book for the science teacher—elementary, general science, biology, chemistry, or physics, and science club sponsors. It tells how to plan and set up exhibits, display exhibits, and how to put on a show. Numerous student projects are described from the fields of biology, chemistry, physics, astronomy. This is a rich source of some very interesting and spectacular experiments.

This is a fine book especially recommended for science club sponsors and club members and for junior-senior high school science club members.

PEARL, RICHARD M. *Rocks and Minerals.* New York (105 Fifth Avenue): Barnes and Noble, Inc., 1956. 275 P. $1.95.

This is one of the numerous *Everyday Handbook Series. Rocks and Minerals* presents in popular language for the general reader the most recent accurate knowledge about the entire range of the mineral kingdom. Minerals, rocks, ores, metals, gems, crystals, meteorites, and artificial minerals are covered from their origin and world-wide occurence to their current industrial uses.

The book explains how rocks and minerals are classified, how they can be recognized and identified, and how they should be collected and displayed. There are numerous illustrations, a number in color, and a glossary and bibliography is included.

Elementary science teachers, general science teachers, and persons interested in rocks and minerals will find this a most useful reference handbook as well as interesting reading.

BROWN, E. S. *Life In Fresh Water.* New York (114 Fifth Avenue): Oxford University Press, 1956. 64 P. $2.75.

This is the sixth volume to appear in the *Oxford Visual Series* which deals with subjects connected with the physical or natural sciences. The purpose of the series is to arouse the interest of the beginner and to present the material in a simple way that can be understood by those who have little knowledge of the subject. The visual method in which text and illustrations are of equal importance is suited to subjects which can often be explained more simply in pictures than in words.

Life in Fresh Water is an account of the plants and animals living in fresh water-pond, stream, marsh. The book describes their way of life-breathing, movement, feeding, reproduction. The numerous illustrations are in color and in black and white.

This is a good reference book for elementary science teachers and biology teachers and for the high school science book shelf.

BORGESON, GRIFFITH AND LILLIAN. *Home Aquarium Handbook.* New York (480 Lexington Avenue): Arco Publishing Company, 1957. 144 P. $2.00.

This is probably the best illustrated aquarium book that has been published. There are over 300 illustrations and photographs. The authors are confirmed aquarium enthusiasts and have aquaria in their home in southern California. Equipment and ways to maintain an aquarium are described in detail. Altogether this is about as complete a book as one could find relating to aquaria. It is a recommended book for elementary grade teachers, biology and general science teachers, and anyone desiring to start an aquarium.

GROSS, HERBERT H. *Resource Materials Elementary Science. Series I Biology (For Teachers of Intermediate Grades); Series I Biology (For Teachers of Upper Elementary Grades); Series 2 Physical Sciences (For Teachers of Intermediate Grades); Series 2 Physical Sciences (For Teachers of Upper Elementary Grades).* St. Louis, Missouri: Concordia Publishing House, 1954 and 1955. 277 P., 202 P., 121 P., and 200 P.

These four volumes of *Resource Materials for Elementary Science* are designed "to serve as manuals of instructions for teachers in Christian schools." The series was prepared in response to various demands and interests. 1. First and foremost, teachers in Christian schools are concerned about making science teaching more Christian in character, and they are searching for guidance. 2. The field of science is large and growing rapidly, and therefore the selection of materials becomes a problem and in an area in which assistance is wanted. 3. At times the elementary school teacher's training in science is limited. Consequently he cannot vitalize his instruction with interesting detail. Therefore he searches for help.

The numerous units are designed to give both content and method. The general pattern for each unit: approach, something to learn enrichment, interesting facts, something to do, and test.

SCHEELE, WILLIAM E. *The First Mammals.* New York: The World Publishing Company, 1955. 128 P. $4.95.

The First Mammals does for mammals what the earlier book *Prehistoric Animals* did for beginning life. Thus this book is the story of the

animals that have dominated the earth for the last 60 million years.

In both word and vivid illustrations, Mr. Scheele describes the major steps in the development of mammals. Maps and charts help to round out the picture. The largest mammal that has ever lived is the living blue whale with a record length of 119 feet, the tallest an extinct harmless rhinoceros 18 feet at the shoulders or the extinct alticamelus also 18 feet tall.

This is an excellent reference for the elementary science or biology teacher, for general readers and students and for the upper elementary science, junior high school science, and secondary school science book shelf.

W. M. Welch Scientific Company. *Elementary Experiments in Science.* Chicago (1515 Sedgwick Street): W. M. Welch Scientific Company, 1955. 88 P. $2.00.

Some 88 experiments for use in the fifth through ninth grades are found in this manual designed for use with the Welch "Rol-a-lab."

This "Rol-a-Lab" and manual may be the answer to the elementary science equipment for many schools.

The Manual with complete directions for each experiment may be used with any textbook or without a textbook!

Each experiment is accompanied by illustrations to show the teacher how to set up the apparatus completely. Practically all materials needed for the experiments are supplied in the "Rol-a-Lab" including gas. Expendable materials are available on order. The "Rol-a-Lab" may be moved from room to room as circumstances demand. It solves the storage space in crowded schools and provides a complete science course at economical cost. Undoubtedly this manual and the "Rol-a-Lab" will find most extensive useage in the years ahead.

Hochman, Vivienne. *Trips in Early Childhood Education.* New York (69 Bank Street): Bank Street Publications, 1957. 26 P. $0.50.

Primary teachers will find this a very fine publication. It discusses preparation for the trip; use of trip experiences in classroom; trips to be taken: Post Office, Fire Station; Public Library; Police Department; Traffic; Water supply; Street lights; Food store; Parks and playgrounds; etc.

Frank, Annette D., and Pine, Tillie S. *Trip Experiences in the Social Studies.* New York (69 Bank Street): Bank Street Publications, 1957. 26 P. $0.50.

This excellent pamphlet discusses: Preparation for a Trip Community Functions; Geographical Learnings; Transportation; Production and Distribution; Historical Backgrounds; Other Cultures; Books for Teachers; New York City Directory.

Although listed as trips in social studies, the pamphlet is just as useful to science teachers.

Hochman, Vivienne, and Greenwald, Mildred. *Science Experiences in Early Childhood Education.* New York (69 Bank Street): Bank Street Publication. 25 P. $.50.

Primary pupils and teachers will find this an unusually fine, helpful publication—based on actual teacher work with primary pupils. There are five parts to the pamphlet: Sensory Experiences, Weather, Cooking Experiences, Experimentation with Mechanical Processes, and Highlighting Science in the Social Studies.

Only simple, readily accessible materials are required for the suggested experiments.

Blackwood, Paul E., Ruchlis, Hyman, and Brandwein, Paul. *Discoveries in Magnetism and Junior Scientist's Kit.* Chicago (57 West Grand Boulevard): Science Research Associates, 1956. 48 P.

A science kit consisting of sufficient materials to do 75 experiments in magnetism accompany the booklet *Discoveries in Magnetism.* Kit materials include two small powerful alnico magnets, iron filings, two compasses, magnetic and nonmagnetic substances.

The booklet tells junior exactly how to do each of the 75 experiments. Blank spaces are provided for writing in the observations made. A teacher's key is available in which correct observations and conclusions are given.

This Kit and unit will give elementary grade youngsters a good understanding of magnetism. This is a fine kit and unit for elementary school science classes.

What We Get From Trees and *Forests and the Natural Water Cycle.* Washington, D. C.: Forest Service, U. S. Department of Agriculture, 1957. Free to teachers.

What We Get from Trees is a large poster depicting some of the products obtained from trees. Glossy 8 by 10 prints may also be obtained.

Forests and the Natural Water Cycle is a four page conservation teaching unit.

The above material is suitable for elementary, Junior high school, and biology teachers.

Basseches, Maurice, and Beatrice. *Suggestions for Teachers and Club Leaders on Activities Related to Dogs;* Fisher, Pearl M., *Guide to Literature About Dogs;* and McGreevey, John, *Guide to Audio-Visual Aids About Dogs.* New York (250 Park Avenue): The Gaines Dog Research Center, 1956. 64 P., 22 P., 28 P.

These publications are the outgrowth of a School Study Project sponsored by the Gaines Dog Research Center carried out under the direction of Dr. William H. Bristow, noted New York City educator and consultant.

All sorts of activities relating to dogs are suggested. They are suitable for various grade levels. The *Guide to Literature* ranges from poetry to non-fiction and was selected for teachers and librarians. The audio-visual aids pamphlet lists films, film strips, pictures, etc.

SIMON, LEONARD. *Dogs.* New York (250 Park Avenue): Gaines Dog Research Center, 1956. 21 P.

This pamphlet explains how educators can make use in grade and high school of pupils' interest in dogs. The material is based on a questionnaire study and personal interviews with teachers and supervisors. Science ranked high among the subject matter fields indicating use of material relating to dogs.

SCHNEIDER, HERMAN, AND NINA. *Let's Find Out About the Weather.* New York: Grosset and Dunlap, 1956.

This is a science kit on the weather. The simple textual material discusses: Let's Find Out About the Weather and What's in the Weather? Sealed inside the front cover are the materials needed for doing a number of projects which are explained in detail with illustrations. It tells how to make a weather boat, a weather house, an air current wheel, wind vane, anemometer, and barometer—all with the materials supplied in the kit. There are also suggestions for watching the clouds and a blank chart for weather observations.

Here is a science kit that should appeal to most every boy and girl and teach them a lot of science about the weather at the same time. It would be excellent to have this kit in every primary classroom.

SCHNEIDER, HERMAN, AND NINA. *Let's Find Out About Electricity.* New York: Grosset and Dunlap, 1956.

This is an unusually clever yet simple kit that enables boys and girls to build their own electric sets. All of the materials needed are sealed inside the cover of the book. They are pre-cut cardboard parts to put together, wire, metal strips, bulbs, electric sockets, magnet core and brass terminals. Complete directions with diagrams are given to build a telegraph set, a model television studio, a traffic light, a lighthouse, an electric light for a doll house or museum case, and an electric question game. The only thing needed to buy is a flashlight battery.

There are also directions for doing certain magic tricks with static electricity.

There is textual material telling what electricity is, what electricity does, static electricity, current electricity, conductors and insulators, heat and light, the battery, and magnetism.

Surely a lot of boys would be delighted to have this scientific kit. It would be a fine kit for the primary grades to have in the classroom.

WATSON, CARLOS M., AND RICHEY, ROBERT W. *Present Practices and Trends in the Preparation of Elementary School Principals at the Graduate Level.* Bloomington, Indiana: Indiana University, School of Education, 1956. 54 P. $1.00.

This report is based on a questionnaire sent to some 222 colleges and universities having graduate level programs for elementary school principals. Some 137 usuable returns were received. Twenty-seven colleges reported they had programs having no particularly promising features and so were not considered in the study.

The report summarizes some 12 outstanding features of graduate preparation of elementary school principals. Twenty-six conclusions for the study are included.

CURRICULUM RESEARCH REPORT. *A Selected Bibliography in Elementary Science.* New York (Curriculum Center, 130 West 55th Street): Bureau of Curriculum Research, 1955. 32 P.

This is a briefly annotated bibliography divided into the following units: Science Books (under 9 headings and 20 pages), Textbooks, Encyclopedias, Periodicals, Teaching Science, Bulletins and Yearbooks, Bibliographies, and Appendix.

The titles cover grades K-6 and should be of value to teachers, supervisors, and teacher education personnel.

WALKER, HERBERT. *Health in the Elementary School.* New York (15 East 26th Street): The Ronald Press Company, 1955. 288 P. $4.00.

Health in the Elementary School emphasizes the role of the classroom teacher in this most important aspect of elementary education. The regular classroom teacher is in the most strategic position for influencing the health welfare of school children.

The educational principles as they apply in a health teaching program are stressed. Major topics considered in this book are: Health in the Elementary School Today, The Measurement of Physical Growth and Development, Procedures in Health Guidance, The Conservation of Vision and Hearing, Control of the Common Communicable Diseases in Children, Emergency Care in Accidents and Sudden Illness, The Program for Physically Handicapped Children in School, The Program of Health Teaching, The Programs of Safety and Physical Education, The Role of the Teacher in Mental Health, School and Community Relationships, Evaluation of the School Health Program.

This is a fine book for both in-service and pre-service teachers.

DOANE, PELAGIE. *Poems of Praise.* Chicago (333 East Lake Street): J. B. Lippincott Company, 1955. 144 P. $2.75.

The poems in this anthology have been collected from many sources. Some are very

familiar and others are not so well known. In general, all of them tell of God and His love and give to little children a sense of His presence in everything about them.

This is truly a book to be loved and cherished by young and old alike. The poetry in it is ageless but simple, beautiful, dignified, and reverent. It is a fine book for parents, teachers, and children. The teacher will find many beautiful poems to read to children and by so doing may instill in them the thrill and delight of inspiring poems. Most of the poems are suitable for any grade level. This a fine book for any elementary classroom.

Burns, William A. *Horses and Their Ancestors.* New York (330 West 42nd Street): Whittlesey House, McGraw-Hill Book Company, 1954. 64 P. $2.75.

This is a McGraw-Hill—American Museum of Natural History publication. Mr. Burns is assistant to the Director of the American Museum of Natural History and author of the delightful book *A World Full of Homes.* The illustrations in color are by Paula Hutchinson.

This book traces the history of the horse through millions of years, from the dawn—horse eohippus—no longer than a fox—to the various kinds of modern day horses. The story tells how differences in food, climate, and breeding have given us the modern horse. Horses have served man in all sorts of ways down through the ages.

This is a fine book—for general reading or for accurate resource material—for the 10–14 year old youngster (or the adult). Elementary science teachers will find the book also useful as background reading and for reference.

Brown, Vinson. *How to Make a Miniature Zoo.* Boston (34 Beacon Street): Little, Brown and Company, 1956. 212 P. $2.75.

Home and school zoos are best if they contain only the smaller animals which can be housed and controlled properly for their own comfort and everybody else's. This book explains how to collect and manage all sorts of live small animals. It tells how to plan both inside and outside zoos, inexpensive, medium-sized, and large; and how to collect, cage, and care for all sorts of fish, amphibians, reptiles, mammals, and birds.

Many clear and careful drawings and diagrams by Don Greame Kelley show exactly what one needs to know about zoo plans, tools, cages, and inhabitants. If you plan a zoo, here is the book you are looking for. If you now have a zoo, the book will give you many practical suggestions for improving it.

Shannon, Terry. *Among the Rocks.* New York (215 East 37th Street): Sterling Publishing Company, Inc., 1956. Unpaged. $2.50.

Here's a fine book for beginners in the study of rocks and minerals. The book is suitable for eight-to-twelve year-olds. Unusually fine illustrations in color by Charles Payzant add much to the attractiveness and usefulness of the book.

The book describes the things needed in collecting minerals, tells about the different kinds of rocks, the hardness scale for classifying rocks, the different kinds of rocks, identifying rocks by crystals, streaks, splits, hardness, unusual rocks, the use of rocks, and rock exhibits.

This is a fine book for the elementary science book shelf.

Shuttlesworth, Dorthy. *The Story of Rocks.* Garden City, New York: Garden City Books, 1956. 56 P. $2.50.

Many a boy and girl are rock collectors. The real interest in any collection is being able to identify the rocks found, know something of their history, and how they came to be in that particular place. This book is intended to help one identify the rocks they find.

Contents include: Getting Acquainted With Rocks and Minerals; Rock Forming Minerals; Precious and Practical Minerals; Fire-Formed Rocks; Secondhand Rocks; History Books In Stone; Born of Heat and Pressure; Ores, Rock Oddities and Mineral Marvels; Strictly for Rock-Hounds; Books to Take on Collecting Trips; and Likely Hunting Grounds.

There are many beautiful illustrations in full color by Suzan N. Swain.

This is an excellent science book for eight-to-fourteen years olds and for the elementary science book shelf. It is accurate, readable, beautifully illustrated, practical.

Mrs. Shuttleworth started working in the American Museum of Natural History at the age of seventeen. After several years there on the staff of *Natural History,* she launched the *Junior Natural History,* serving as its editor for a dozen years. She is now a contributing editor.

Fisher, James. *The Wonderful World of the Sea.* Garden City, New York: Garden City Books, 1957. 68 P. $2.95.

This book unfolds the story of the sea in the same sequence as that in which Nature herself has played the great dramas of the ocean. The seas have always been very important to man. Man came to love and at the same time fear the sea, then he challenged it, and finally began to ransack its secrets. He is still doing the latter and has much yet to learn. Riches untold lie in the sea and, as in the past, it is the source of much of his food, clothing, and warmth. It is just beginning to be mined as a source of man's mineral supplies, including oil. We are only now realizing that the mineral supplies of the sea are much greater than those mined on land.

The book first tells about the primeval oceans, probably unique in our planetary system. It

explains tides, waves, storms, currents, the ocean depths, the ocean surface, animal and plant life found in the ocean, man's adventures across the seas, the use of the sea as a source of food, fat and oil, and minerals. Recreation is not omitted!

There are over 200 paintings, maps, and diagrams in full color. Altogether this is one of the finest books about the sea the reviewer has seen in a long time, if ever. It is highly recommended for the science book shelf—probably junior or senior high school level, and for teachers in elementary schools. The better students in the upper grades can readily read and understand it.

COATSWORTH, ELIZABETH, AND BARNES, KATE. *The Giant Golden Book of Dogs, Cats, and Horses.* New York (Rockefeller Center): Simon and Schuster, 1957. 124 P. $2.95.

This unusually attractive book has 61 stories and poems about dogs, cats, and horses. These are animals that have always been the favorites of children—farm or city, small or large. A number of the stories first appeared in *Christian Science Monitor.* All, or practically all, of the stories will be new to children and to the teacher. The stories should serve as a good antidote to the overdose of "blood and thunder" stories children see in movies and on television. Not only the readers, but their playmates, classmates, brother, sisters and parents will learn to care for, love, and respect animals.

This is a fine book for the elementary school book shelf. Pictures in color by Feodor Rojankovsky are a very important part of this book that will delight most children.

WATSON, JANE WERNER. *The Golden History of the World.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1955. 156 P. $3.95.

The Golden History of the World is one of the beautiful, magnificent Simon and Schuster *Giant Golden Books.* The hundreds of pictures and illustrations in color are by Cornelius Dewitt. Even the table of contents has an intriguing illustration at each heading—45 in all.

It would surely be very difficult to find a more attractive, appealing book. The illustrations in themselves tell a lot of history. This is truly a history of the world, beginning with the first men of a million years ago and coming down to the present time. It is truly remarkable that the author was able to say so much in so few pages and with so many illustrations. One feels like when they get through that they have a pretty good birdseye's view of the history of the world down to 1957!

Surely this book will appeal to most children and the pictures will entice many of them to become interested in history. Teachers will like the history, too! It will be an usually fine addition to the elementary school book shelf or even the junior high or senior high school book shelf!

WYLER, ROSE, AND AMES, GERALD. *The Golden Book of Astronomy.* New York. (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1955. 97 P. $3.95.

The Golden Book of Astronomy is a child's introduction to the wonders of space. Truly this is a magnificent book, filled with over 200 illustrations in color (by John Polgreen), and filled with interesting information about time, calendar, gravity, seasons, tides, sun, moon, planets, comets, asteroids, nebulae, and the wonderful phenomena of the heavens. The book tells, too, about refracting, reflecting, and radio telescopes; ways to measure distances to the stars, the latest theories about the origin of the solar system, and even the possibilities of space travel. The book is one of the famous *Simon and Schuster Giant Golden Books.*

Altogether this is a wonderful book for elementary science teachers and for the elementary science book shelf. It would seem to be tops for a book on astronomy suited to elementary children,—probably best for intermediate grade level. It is a book that will be read and reread and referred to time and time again.

The authors are well known science writers and several of their books have been reviewed in *Science Education.* Miss Wyler is known by many of our readers. The book was checked for scientific accuracy by Professor Bart J. Bok of Harvard University, noted astronomer.

BRIDGES, WILLIAM. *Zoo Pets.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 95 P. $2.50.

Zoo keepers are friendly with a number of animals—strange pets to most persons. This book tells about many of these pets at the New York Zoological Park. Appealing photographs of many incidents described in the textual material are included. The author is Curator of Publications of the New York Zoological Park.

Children of all ages from six up will enjoy the interesting stories and photographs of the Pete the hippopotamus, Kenneth the monkey, Candy the baby elephant and Pinky, Candy's elephant friend, Joe the anaconda, the Hummingbird, Flip the sea lion, the polar bears that hated each other, William and Mary the penguins, and Oka the gorilla that built a nest. This is a fine book for any elementary science book shelf.

BLEEKER, SONIA. *The Pueblo Indians.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 155 P. $2.00.

The Pueblo Indians are farmers of the Rio Grande from away back. This book traces their every day living from before Columbus down to the present time. Young Hawk lived in an adobe house two stories high. The Pueblos lived in a group of such houses on a high rocky, treeless mesa overlooking the Rio Grande below.

Entrance to the second story was by means of ladders which could be hauled up in case of danger. The houses were cool on the inside in summer and warm in the winter.

The farmers raised several different colors of corn, squash, gourds, tobacco, and onions. The peace time activities of the Pueblos are described—raising corn, irrigation, baking, weaving, making pottery, hunting rabbits, the ceremonials and dances and trading. Finally the Spaniards came, destroyed the Pueblos homes and in the end conquered them outwardly at least.

This *Morrow Junior Book* is another in the fine series of books about Indians, suitable for 8 to 12 year olds.

Bleeker, Sonia. *The Chippewa Indians.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 157 P. $2.00.

The Chippewa Indians are known as the rice gatherers of the Great Lakes. The crane was the sign of Older Brother's clean totem.

The Chippewa followed a life of unvarying seasonal travel: Spring, at the maple-sugar groves; Summer, on the lake shore; Autumn, working in the rice fields; Winter, deep in the protective forest. Here, vividly portrayed through the Crane family's activities, is a complete picture of the way the Chippewa lived, from the building of a birch bark canoe to the training of a medicine man. There is a final chapter of how 50,000 Chippewa live in Michigan, Wisconsin, Minnesota and North Dakota. Only the Navaho and Sioux tribes are larger. However, sad to say the Chippewas are among the poorest citizens of our United States.

This *Morrow Junior* Book is one of the outstanding Bleeker books on the peace-time, every day activities of numerous tribes of Indians. Her previous books include *Indians of the Long Shore, The Apache Indians, The Sea Hunters, The Cherokee, The Crow Indians, The Delaware Indians, The Seminole Indians,* and *The Pueblo Indians.*

Bleeker, Sonia. *The Mission Indians of California.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 142 P. $2.00.

This is Sonia Bleeker's tenth book about American Indian tribes. All have been reviewed in *Science Education.* They truly constitute an important addition to a better understanding of Indian life and are recommended for all school libraries—upper grade through secondary. Most eight to twelve year olds should be able to read the books. The series have been most enjoyable to the reviewer.

The Mission Indians of California is built around the life of Little Singer who lived in the San Diego area when a Spanish expedition arrived there in 1769. Before and after this Little Singer's life was in great contrast. The author skillfully weaves an authentic description of the old way of life and the troubled times that followed up to 1846 when the United States government gained control of California. Less than 3,000 Indians of the 30,000 which once populated California still remain.

As in all previous books, the author stresses the everyday, peace time activities of the Indians, rather than warlike activities all too commonly associated with Indian life.

Sonia Bleeker is the wife of Herbert S. Zim, well-known science writer and a member of N.A.R.S.T. They now reside in Florida.

MacGregor, Ellen. *Miss Pickerell Goes to the Arctic.* New York (330 West 42nd Street): Whittlesey House, McGraw-Hill Book Company, 1954. 126 P. $2.25.

It is with sadness one writes this review of Miss MacGregor's last book of this series. One could wish these adventures of Miss Pickerell and her amusing, unusual cow could go on and on.

The series has been a mixture of science and adventure, written in a humorous vein so enjoyed by readers. As always, impetuous, adventurous, yet ready-for-any emergency Miss Pickerell comes out on top on her rescue mission of a weather expedition to the Arctic. Again she makes a valuable contribution to science—this time in weather-forecasting.

The previous titles in the series are *Miss Pickerell Goes to Mars, Miss Pickerell and the Geiger Counter,* and *Miss Pickerell Goes Undersea.* Each title is an excellent book for any upper grammar grade or junior high school boy or girl, and for the school library as well.

Jackson, Kathryn. *The Golden Picture Book of School Days.* New York (Rockefeller Center): Simon and Schuster, 1955. 64 P. $1.00.

This is one of The Fun-to-Learn Golden Books, edited by Mary M. Reed, formerly of Teachers College, Columbia University. The book is beautifully illustrated by Violet Lamont.

This book shows that learning can be fun. *School Days* combines an enjoyable story with an abundance of activities which make it possible for the child to relive at home the experiences enjoyed at school. Numerous games and suggestions are given from readily available materials. Lilting rhymes add charm to high-interest material that has been adapted to the reading ability of the primary-school child.

Primary children will really like this book. It is a fine book for parents to give to their children and teachers can find many suggestions for doing a better teaching job. It is a fine book for the primary-school book shelf. A lot of science here, too!

Govoni, Ilse Hayes and Smith, Dorothy Hall. *The Golden Picture Book of Poems.* New York (Rockefeller Center): Simon and Schuster, 1955. 49 P. $1.00.

This is a *Fun-to-Learn Golden Book.* The au-

thors have selected some 80 poems for children to read and learn. There are attractive pictures in color by Grace Dalles Clarke.

The poems will appeal to primary children. Some they can soon read themselves and others they will enjoy having the teacher read to them. This attractive book makes a fine beginning to *develop* in children a love and taste for beautiful poems. It is a fine book for the elementary school book shelf.

WERNER, JANE. *The Golden Picture Book of Words.* New York (Rockefeller Center): Simon and Schuster, 1955. 64 P. $1.00.

This *Fun-to-Learn Golden Book* tells how words look and what they tell. Attractive pictures in color by Cornelius Dewitt make the book much easier to read. So many different things found in primary children's every day lives are pictured and used in the interesting textual material. Words are in red at each margin of the paper with the object pictured in color above the word.

Things found in the house, the new baby, clothes-closet cleaning day, play, food, store, pets, school days, pictures, music, city, farm, garden, circus, tools, machines, park, birds, plants, animals, weather, place, seashore, trains, planes, boats, letters, friends, and sights are pictured and talked about. This book would seem to be an excellent aid in vocabulary building as well as for developing reading skills. It is a fine book to have in the primary-school classroom.

MOORE, LILIAN. *The Golden Picture Dictionary.* New York (Rockefeller Center): Simon and Schuster, 1955. 80 P. $1.00.

This *Fun-to-Learn Golden Book* is a real dictionary. There are more than 800 words for beginning readers. It is a picture dictionary. Pictures in color by Beth and Joe Krush are used wherever possible. Most of the vocabulary is already familiar to the child in his reading and spelling. The word to be defined is in large type above the definition and is *italicized* in the definition itself. The definitions are not just dry-as-dust definitions but are more of the nature of explanations.

This dictionary will have an appeal in itself, much as do many present-day reading books. This is a fine book for developing the "dictionary habit" in youngsters in the primary grades. It is not only a fine dictionary for each boy and girl in the primary-school but also a fine book to have in each primary-school classroom.

PODENDORF, ILLA. *The True Book of Seasons.* Chicago (Jackson Boulevard and Racine Avenue): Children's Press, 1955. 47 P. $2.00.

This is a simple explanation of why some parts of the earth have changing seasons and how living things adapt to the changes and prepare for them. The book is of first grade level.

The author is a teacher of elementary science in the Laboratory School of the University of Chicago. Illustrations in color are by Mary Gehr.

PODENDORF, ILLA. *The True Book of Sounds We Hear.* Chicago (Jackson Boulevard and Racine Avenue): Children's Press, 1955. 47 P. $2.00.

This is a first grade book showing how sounds are made and heard. There are meaningful sounds all around us. From the human ear and other animal ears that are similar, the author goes to grasshoppers, crickets, and other animals that have interesting ways of hearing.

The illustrations in color by Chauncey Maltman are truly outstanding.

PODENDORF, ILLA. *The True Book of Weeds and Wild Flowers.* Chicago (Jackson Boulevard at Racine Avenue): Children's Press, 1955. 48 P. $2.00.

This first or second grade book introduces young readers to interesting weeds and flowers of the dooryard, the roadside, the garden, the fields, and the woods. The book should help children to recognize harmful weeds and see the importance of conservation of wild flowers.

There are beautiful illustrations in color by Mary Gehr. As in all of the *True Book* series, 98 percent of the text is in words from the combined word list for Primary Reading. The author teaches in the Laboratory School of the University of Chicago.

CLARK, MARY LOU. *The True Book of Dinosaurs.* Chicago (Jackson Boulevard at Racine Avenue): Children's Press, 1955. 47 P. $2.00.

This book for primary children introduces them to dinosaurs—a number of different kinds. The book is easy-to-read, exciting, understandable. Illustrations in color by Chauncey Maltman make the book much more appealing and understandable to children.

LEAVITT, JEROME. *The True Book of Tools for Building.* Chicago (Jackson Boulevard at Racine Avenue): Children's Press, 1955. 46 P. $2.00.

Any child, or most children will enjoy this introduction to tools for building. The primary pupil can read and understand the book himself. The book will help the child to identify various tools, how to use them safely, and how to take care of them. The illustrations in color are by Bill Armstrong.

HARMER, MABEL. *The True Book of the Circus.* Chicago (Jackson Boulevard at Racine Avenue): Children's Press, 1955. Unpaged. $2.00.

Children who love a circus (Is there any child who doesn't?) will enjoy this book as it tells about the work of the circus and the animals, too. They will prefer reading this book to their regular readers! Illustrations in color are by Loran Wilford of Sarasota, Florida, who lives near the winter quarters of the Ringling Brothers–Barnum and Bailey Circus.

Miner, O. Irene Sevrey. *The True Book of Our Post Office and Its Helpers.* Chicago (Jackson Boulevard at Racine Avenue): Children's Press, 1955. 44 P. $2.00.

Most children know the mailman who brings the mail. This book for first and second graders gives an overall picture of the work of the Post Office and its helpers. It tells how mail travels to its destination. It takes a lot of work and many helpers to deliver a piece of mail. Illustrations are by Irene Miner and Mary Salem.

Nighbert, Esther. *The True Book of Cloth.* Chicago (Jackson Boulevard and Racine Avenue): Children's Press, 1955. 47 P. $2.00.

This first grade book in simple text and attractive pictures in color tells the story of wool, cotton, linen, silk and man-made cloth. There are animals from which the wool comes, then the spinning mill and the looms. Other types of cloth are treated similarly.

This is a most attractive book.

Horwich, Frances F. *Miss Frances' Storybook of Manners for the Very Young.* Chicago: Rand McNally & Company, 1955. 128 P. $2.95.

This *Ding Dong School Book* in an interesting, effective way attempts to teach youngsters fundamental good manners for happy everyday living. Such a book as this fills a long felt need. Nearly every aspect of a youngster's life is covered: Table manners, greetings, farewells, parties, picnics, dining, introduction, hurting someone, church behavior, compliments, public conveyances, talking, and so on. The book is well-indexed.

Colorful drawings by Mina Gow understandingly illustrate each situation. Children will realize that good manners can be real fun and make life more pleasant for everyone.

Among recent honors, Dr. Horwich has been selected by women editors of the Associated Press as "Woman of the year in Education." She is Supervisor of Children's Program for N.B.C. and wellknown writer of the *Ding Dong School Book* series.

Surely this is one of the finest, most practical books parents and primary grade teachers could have. It is also an unusually attractive book in format, too.

Horwich, Frances R. and Werrenrath, Jr., Reinald. *Miss Frances' All-Day-Long Book.* Chicago: Rand McNally & Company, 1954. 72 P.

This *Ding Dong School Book* describes many activities suitable for pre-school children—activities for different times of the day. Parents should find the book especially helpful but first-grade and kindergarten teachers will find many worthwhile suggestions, too. It stimulates "thinking together" and "doing together" in furthering the child's social development. Altogether this is a book with numerous activity suggestions. It is illustrated in color by Katherine Evans.

Horwich, Frances R. and Werrenrath, Jr., Reinald. *The Robin Family.* Chicago: Rand McNally and Company. 1954. Unpaged. $0.25.

This is another *Ding Dong School Book* charmingly illustrated in color by Lucy Ozone. First grade children will love the story about the robin family.

Horwich, Frances R. and Werrenrath, Jr., Reinald. *Looking Out the Window.* Chicago: Rand McNally & Company, 1954. Unpaged $0.25.

Looking Out the Window is a *Ding Dong School Book* that is sure to appeal to first-graders. It is appealingly illustrated in color by Leonard Shortall.

Horwich, Frances R. and Werrenrath, Jr., Reinald. *Grandmother Is Coming.* Chicago: Rand McNally & Company, 1954. Unpaged. $0.25.

Every morning when the school bell rings across the N.B.C. network, millions of youngsters are gathered in front of television sets from coast to coast to spend time with their beloved Miss Frances (Dr. Frances R. Horwich), schoolmistress of T.V.'s most outstanding children's Program, Ding Dong School. Dr. Horwich is one of America's foremost educators, and has captivated both parents and children by combining nursery-school fun with sound educational principles in her unique program.

This *Ding Dong School Book* is based on a very real experience for many children—Grandma is Coming. It is charmingly illustrated in color by Ruth van Tellingen. The book is suitable for first graders.

Jones, Mary Alice. *Friends of Jesus.* Chicago: Rand McNally and Company, 1954. Unpaged. $0.15.

This booklet is suitable for first and second grade children. It is beautifully illustrated in color by Janet Robson Kennedy. There are three stories: Friends Who Had a Boat; Jesus, the Children's Friend; and A Friend the Others Did Not Like.

Munn, Ian. *Johnny and the Birds.* Chicago: Rand McNally & Company, 1955. Unpaged. $1.00.

This is an unusually attractive book about birds. Illustrations in color are by Elizabeth Webbe. The textual material is about first or second grade level. Birds include the catbird, blue jays, robins, chickadees, and crow.

This is a fine book for the elementary school science book shelf.

Perkins, Marlin. *Zooparade.* Chicago: Rand McNally & Company, 1954. 96 P. $2.95.

Every Sunday afternoon millions of families across the country settle down in their living rooms for a trip to the zoo via television. The program is that long-time favorite, "Zooparade,"

and the star is Marlin Perkins, the world's best-known and best-loved zoo director.

In this book, the author does in writing what he has so long been doing in television. No one is better qualified than this famed director of Chicago's noted Lincoln Park Zoo. The black and white and color illustrations are a most integral and fascinating part of the work.

Here one reads interesting things about Judy the Elephant, Dillinger the Lion, Shah and Sheba the Cheetahs, Dotty the Kangaroo, Georgie-Joe the Rhinoceros, Sally the Grizzly Bear, Sinbad the Gorilla, Bubble and Tilly the Otters, Frank the Zebra, Noali the Camel, Heinie II the Chimpanzee, Chico the Capuchin Monkey, Moussance the Fennec, Junior the Giraffe, Buster the Sea Lion, Icicle the Polar Bear, Domingo the Fallow Deer, Moko the Buffalo, and Ling Wong the Orangutan.

This is truly a most outstanding book and will be read and enjoyed by many thousand boys and girls, and adults, too. It is highly recommended for the elementary science book shelf—almost any grade level. Who does not love to go to a circus or to a zoo just to see the animals!

EPPLE, ANNE ORTH. *Nature Quiz Book.* New York (200 Fifth Avenue): The Platt and Munk Company, Inc., 1954. Unpaged. $1.25.

A lot of pupils, teachers, and nature lovers who enjoy quiz games will enjoy this interesting, educational, and informative quiz book about some of the wonders of nature. There are 26 quizzes of 25 questions each. Answers are given in the back of the book. Here's a chance to check up on your own knowledge and check up on that of your pals! It would make a good book for the elementary and the junior high secondary science book shelf.

SEARS, PAUL MCCUTCHEON. *Barn Swallow.* New York (8 West 13th Street): Holiday House, 1955. 45 P. $2.00.

Barn Swallow is a story of a year of life of the barn swallow from first take-off from a nest in the Mississippi Valley, through his 6,000-mile migration to South America and back—to the feeding of his own nestlings.

The barn swallow has made man's habitat his own, nesting in barns and sheds, under bridges and wharves, and even in boat houses. Its only food is flying insects, used in great quantities. The swallow is streamlined for maneuvering, gliding flight and yet at the same time has the structure for strength and endurance. On the wing, it eats drinks, bathes, courts a mate, builds a nest with expert masonry, and trains its young.

In summer, barn swallows breed throughout most of the United States and Canada.

The book was checked for accuracy by Dr. Arthur A. Allen, noted Ornithologist of Cornell University. The beautiful illustrations in color are by Walter Ferguson.

This is an excellent book for the elementary science library.

PIPER, WATTY. *Animal Story Book.* New York: The Platt and Munk Company, Inc. 1954. Unpaged.

Betty and Billy arrive at Grandfather's farm to spend their summer vacation with their grandparents. They soon make friends with, and learn many interesting things about the different animals and how they help us in our daily lives.

There are twelve stories about the following farm animals: sheep, chickens, dog, cattle, horses, mules, rabbits, pigs, cats, ducks, turkeys, and goats.

The stories will appeal to children—read to them in the primary grades or read on their own in the intermediate and upper grades. The colored pictures by Wesley Dennis will hold most children's interest for long periods of time. The heavy, glossy paper enhances the excellent pictures. This is a fine book for about any level elementary school child with some well-told stories in the textual material.

BLOCH, MARIE HALUN. *Dinosaurs.* New York (210 Madison Avenue): Coward-McCann, Inc. 1955. Unpaged. $2.00.

In words and pictures this book answers many questions about dinosaurs—what they looked like, how did they act, where did they live, what did they eat, how did they fight their enemies, and so on. For almost one hundred and forty million years the dinosaurs almost had the earth to themselves. Chains of mountains reared up, mountains disappeared, oceans overflowed and in these great changes, the dinosaurs could no longer adapt themselves to a changing world. Some dinosaurs weighed as much as six times an elephant, but with brains so small they sometimes had two of them. Some were mild and others most ferocious.

The illustrations in brown, black, and white are by George F. Mason, Associate Curator of the Department of Education of the American Museum of Natural History. The book is suitable reading for boys and girls 7 to 12 years of age and would make an excellent addition to the elementary science book shelf.

CLASTER, NANCY. *Romper Room Do Bees: A Book of Manners.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Shouster, 1956. Unpaged. $.25.

Illustrated in color by Eleanor Dart, this *Little Golden Book* is a very attractive one for first graders. Boys and girls can learn a lot of Do Bees and Don't Bees. It is a fine book to teach first graders good manners.

STEVENSON, ROBERT LOUIS. *A Child's Garden of Verses.* New York (630 Fifth Avenue): Simon and Schuster, 1957. Unpaged. $0.25.

This Little Golden Book is beautifully illustrated by Eloise Watkin. *A Child's Garden of Verses* made its first appearance in England in 1885 and has been much loved by children since.

MOORE, CLEMENT C. *The Night Before Christmas.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.49.

Child-appealing pictures in color and black and white are an integral part of the children's favorite Christmas story *The Night Before Christmas.* Here is a most attractive book that will appeal to all pre-school as well as primary-grade level children.

The book is one of new series of Simon and Schuster *Golden Forty-Niner* books.

LEWICKI, LILLIAN. *The Golden Book of Christmas Tales.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 29 P. $1.50.

Christmas legends from many lands are related in this most beautifully illustrated book in gorgeous colors. The paintings are by James Lewicki.

Christmas is a time of miracles and marvels centered around the Holy Birth in Bethlehem. For centuries, people of many lands have told tales of wondrous happenings. Some of these legends are: The Cherry Tree, The Talking Animals, The Christmas Rose, Angel's Gifts, The Little Stranger, The Robin, Mantle of Fire, The Nightingale, The Miraculous Harvest, The Fly and the Spider, Herod and the Cock, Saint Christopher, The Glastonbury Thorn, Saint Nicholas, Saint Francis, and The Three Kings.

BRADDOCK, JONATHAN. *Bible Stories.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 29 P. $0.49.

This Golden Forty-Niner book tells about the creation of the earth, the Garden of Eden, Noah and the Flood, Joseph and His Brothers, and Moses and the Commandments.

Beautiful pictures in color by Stelle Savage add to the charm and interest of this book. It is a highly recommended book for primary children or pre-school children, too.

EVANS, DALE. *Prayer Book for Children.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $1.00.

This is an unusually beautiful book. The illustrations in vivid color are by Eleanor Dart. A number of prayers for children by several different writers, suitable for varied conditions, are included.

The book is wholly non-creedal in viewpoint. This *Big Golden Book* is a fine gift for any primary-age child.

WATSON, JANE WERNER: *The Story of Baby Jesus.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $0.25.

This Little Golden Stamp Book has stamps to be pasted in appropriate spaces opposite events relating to the early life of Jesus. Illustrations are by Eloise Wilkin.

WATSON, JANE WERNER. *My First Book About God.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $1.00.

My First Book About God is a Golden Book. The book is designed to teach reverence and is unusually attractive, suitable for a child of any religious denomination. The book is beautifully illustrated in color by Eloise Wilkin. Three major ideas are emphasized; *God Is Great, God Is Good, and God Is Love.*

WATSON, JANE WERNER. *The Story of Jesus.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, Inc., 1957. 48 P. $.50.

This is a golden stamp book of the *Story of Jesus.* Pictures are by John Leone. There are 48 stamps to be appropriately placed in the book and 48 stories or incidents taken from the life of Jesus. Children will learn much about Jesus through the stories told and the use of the colored stamps. The artistic stamps constitute valuable stories in themselves.

WATSON, JANE WARNER. *My Little Golden Book About God.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

This book for pre-school and primary children was produced under the supervision of Dr. Mary Reed, formerly of Teachers College, Columbia University.

Pictures in color by Eloise Wilkin and a well-selected textual material makes this a highly recommended book for any child.

DALY, KATHLEEN N. *Travel.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $.25.

Beautifully illustrated in color by Tibor Gergely, this *Little Golden Book* is a beginner's book on travel. Travel now and in the long ago are described in text and pictures. This is a fine book for first and second graders.

LEWELLEN, JOHN. *The Boy Scientist.* New York (Rockefeller Center, 530 Fifth Avenue: Rockefeller Center): Simon and Schuster, 1955. 264 P. $3.95.

While appealing more to boys, many girls and many adults will find this a most interesting book on physical science. In simple, easy to understand language, the author makes readily comprehensible many of the important laws and discoveries in physical science. Many experiments are suggested and explained in the text. Drawings and diagrams by Robert Baker make the experiments much easier to carry out and understand.

The varied principles of science are interwoven with interesting incidents from the lives of numerous scientists: Galileo, Newton, Boyle, Pascal, Mersenne, Huygens, Rumford, Franklin, Faraday, Planck, and Einstein.

This is a fine reference book for elementary science teachers, teen-age boys and girls, and for the secondary science book shelf.

GOTTLIEB, WILLIAM P. *The Four Seasons.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, Inc., 1957. Unpaged. $1.00.

This is a story about Billy and his dog Buff and what they do and see during the four seasons of the year. The pictures in color by the author are as important or even more important than the reading material itself. The pictures are unusually fine and make a story in themselves.

In format, pictures, and reading material this is a most appealing book. It is most suitable for the primary grades and is highly recommended for the elementary science book shelf.

WATSON, JANE WERNER. *How to Tell Time.* New York (Rockefeller Center): Simon and Schuster, 1957. Unpaged. $.25.

This *Little Golden Book* tells first graders how to tell time. They will not only learn to tell time by clocks and watches, but they will also learn a lot about ancient and modern time—telling devices. Pictures in color are by Eleanor Dart. There is a clock with real hands visible through the outside cover!

DALY, KATHLEEN N. *Captain Kangaroo.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $.25.

Captain Kangaroo is a well-known television character. This *Little Golden Book* is built around the attempt of Captain Kangaroo to find a home for a little puppy. The book is illustrated in color by Art Seiden. The book is suitable for first and second graders.

DALY, KATHLEEN N. *Captain Kangaroo and the Panda.* New York (Rockefeller Center): Simon and Schuster, 1957. Unpaged. $.25.

This is the second *Little Golden Book* about Captain Kangaroo. In this story he leaves Treasure House where his television admirers usually see him. He travels to the Land Where Pandas Live. Here he and Piff the Panda find bamboo shoots.

There are delightful pictures in color by Edwin Schmidt. Primary children will thoroughly enjoy this book.

SHAPIRO, IRWIN. *Cleo.* New York (Rockefeller Center): Simon and Schuster, 1957. Unpaged. $.25.

This *Little Golden Book* presents the popular basset, Cleo. The hound Cleo delights television audiences in Jackie Cooper's television program, "The People's Choice." Photographs in color are by Durward B. Graybill. First grade children will thoroughly enjoy the antics of this famous dog. This is as delightful a dog book as first graders are likely to find.

IRWIN, KATHLEEN. *Fury.* New York (Rockefeller Center): Simon and Schuster, 1957. Unpaged. $.25.

This *Little Golden Book* is an authorized version based on the famous Fury Television program and was produced under the general supervision of Dr. Mary Reed of Teachers College, Columbia University. The pictures in color are by Mel Crawford.

Children of first grade level will love the story in book form as they have loved Fury on television.

WYLER, ROSE. *About the Sky.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $.25.

Here's a fine science book for first graders. This *Little Golden Book* is illustrated in color by Tibor Gergely. The *Little Golden Books* series are under the general supervision of Dr. Mary Reed, formerly of Teachers College, Columbia University. This book should be a *must* on every first grade science book shelf.

VERRAL, CHARLES SPAIN. *Lassie and the Darling Rescue.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. Unpaged. $0.25.

This *Little Golden Book* presents another delightful story about Lassie, two boys named Jeff and Porky, and a colt.

There are pictures in color by E. Joseph Dreany. The book is recommended for the primary grades.

Walt Disney's Bongo. New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $0.25.

Bongo, beloved circus bear, decides to runaway to the deep woods and be free. Here he meets many adventures—some good, some not. Children of the primary grades will enjoy this Little Golden Book. Illustrations in color are by the Walt Disney Studio.

WATSON, JANE WERNER. *Wonders of Nature.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $0.25.

This Little Golden Book tells about many of the wonders of nature: animals, sea life, fruits, insects, desert life, birds, and so on. Pictures in color are by Eloise Wilkin. This is a fine book for the primary grades.

Scarry, Patsy. *My Baby Brother.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. Unpaged. $0.25.

This Little Golden Book, suitable for first graders, is a story about a little girl and her baby brother. Pictures in color are by Eloise Wilkin.

The Little Golden Mother Goose. New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $0.25.

This Little Golden Book contains seventy-five favorite Mother Goose Rhymes. It is beautifully illustrated in color by Feodor Rojankovsky.

Williams, Garth. *Baby Animals.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. Unpaged. $0.25.

First graders will thoroughly enjoy this Little Golden Book with many colored pictures. Animals pictured and talked about are: bear, squirrel, chipmunk, fox, lamb, possum, skunk, lion, tiger, giraffe, monkey, koala bear, kangaroo, woodchuck, mink, rabbit, racoon, camel, and owl.

Kiene, Julia. *The Step-by-Step Cook Book for Girls and Boys.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 125 P. $2.95.

Girls and boys from eight to eighteen should enjoy learning to cook with this attractive picture cookbook. It is written especially for them and is crammed with tempting, easy-to-make recipes. Each recipe is broken into logical, numbered steps, accompanied by hundreds of graphic, how-to-do-it pictures in color. Many a bride—and some oldsters—would find this book most helpful.

The author is a nationally known home economist and formerly Home Economics Director for Westinghouse Electric Corporation.

Elmo, Horace T. *The Golden Book of Questions and Answers.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. 56 P. $1.00.

Hundreds of questions about people, animals, and places with facts and surprises for children (and many adults) are found in the Golden Book. There are many game Quizzes, true or false tests, odd statistics, and solid information, combined in a delightful mixture of sense and nonsense. Pictures in color are by Tibor Gergely. This is a beautiful book for children and for the school and public library.

Nolen, Barbara. *Black Beauty.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 96 P. $0.69.

This is an abridgment of the classic *Black Beauty* by Anna Sewell, a story that will be loved by children for generations to come. *Black Beauty* was originally written and published in 1877 as a protest against the ill treatment of carriage horses, particularly the use of the cruel checkrein.

This Golden Picture Classic colorfully illustrated by Tom Gill brings to modern boys and girls the best of the flavor, style, and beauty of the original story.

Adapted by Jane Werner Watson. *The Iliad and the Odyssey.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 96 P. $3.95.

The Iliad and the Odyssey has been adapted from the Greek Classics by Jane Werner Watson. Pictures in color are by Alice and Martin Provensen.

The Iliad and the Odyssey are among the best known and best beloved of all stories and are among the oldest in the world. They present the heroic story of the Trojan War and the fabulous adventures of Odysseus. In the adaptation and picturization presented in this De Luxe Golden Book, the stories should be read and enjoyed by thousands of American youngsters, leaving them with memories most of them will not soon forget.

Hill, Deborah. Heidi. New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 96 P. $0.69.

This Golden Picture Class is adaption of Johanna Spyre's beloved story of Heidi, a Swiss orphan girl. The story was first published in 1880.

This abridgment is colorfully illustrated by Grace Dalles Clarke. Children will enjoy this book even much more than the earlier editions.

White, Anne Terry. *The Adventures of Tom Sawyer.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. 96 P. $0.69.

This is an abridgment of Mark Twain's world famous and beloved story of Tom Sawyer. Few Americans have grown up without making the acquaintance of Tom Sawyer. In this Golden Picture Classic are most of the never-to-be-forgotten adventures of Tom Sawyer. Illustrations in color by Hans H. Helweg and the shorter story will have even greater appeal to boys and girls.

White, Anne Terry. *Treasure Island.* New York (630 Fifth Avenue Rockefeller Center): Simon and Schuster, 1956. 96 P. $0.69.

This is a Golden Picture Classic abridgment of Robert Louis Stevenson's famous pirate story. Who can forget the captain as he sings "Fifteen Men on the Dead Man's Chest?" Who can forget Old Pew the blind pirate, Long John Silver, Ben Gunn, and the hero Jim Hawkins!

This abridgment illustrated in color by Hamilton Greene will appeal to a new generation of young readers.

PURCELL, JOHN WALLACE. *The Golden Rainy Day Play Book.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1954. 64 P. $0.50.

The Golden Rainy Day Play Book is filled with all kinds of things to do on a rainy day. Most of the things can be done individually, even in bed. There are riddles, puzzles, jokes, proverbs, optical illusions, tests, games, and so on. A pencil and a pair of scissors is all one needs for the many activities suggested. Answers to puzzles and so on are found at the end of the book.

This is a fine book for primary grade children. Primary teachers will find many good suggestions for individual, group, or even class activity.

BERNHARD, HUBERT J. *Wonders of the World.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 30 P. $0.49.

Wonders of the World with photographs in color and black and white and descriptive material tells about such wonders as the Leaning Tower of Pisa, Natural Bridge, Rock of Gibraltar, Golden Gate Bridge, Great Wall of China, Grand Canyon, Meteor Crater, Paricutin, Christ of the Andes, Rosetta Stone, Old Faithful, Sequoias, Taj Mahal, Petrified Forest, and many others.

This is Golden Forty-Niner book recommended for intermediate and grammar grade levels.

LINDQUIST, WILLIS. *Animals from All Over the World.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 30 P. $0.49.

This book presents many of the better known animals round the world in brief descriptive text and photographs in color and black and white by James Gordon Irving and Sy Barlowe.

This is a recommended Golden Forty-Niner book suitable for all grade levels with textual material suitable for intermediate grade level.

SHAPIRO, IRWIN. *Presidents of the United States.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 30 P. $0.49.

This Golden Forty-Niner book tells briefly about each of the Presidents of the United States. Accompanying each photograph of the president are given the dates he was president, date and state of birth, and date of death. Altogether this is a most attractive and interesting book for upper grade level boys and girls.

SAYERS, FRANK. *Cowboys.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 30 P. $0.49.

Most all boys will be delighted with this Golden Forty-Niner book. Photographs in color and black and white by Hans Helweg and Frank Bolle add charm and interest to this cowboy book describing cowboy activities, brands, clothes and equipment. At least one of these books will be needed for each classroom!

MILOCHE, HILDA, AND KANE, WILMA. *The Little Golden Paper Dolls.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

Little girls will be delighted with this cut-out paper doll book. They can dress their dolls any way they desire.

GOTTLIEB, WILLIAM P. *Farmyard Friends.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

All of the farm animals miss Farmboy Bill as he goes to school for the first time. How they welcome him home! Beautiful pictures in color. This is a first grade Little Golden Book.

BROWN, EMILY. *Walt Disney's Perri.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1957. Unpaged. $1.00.

This story is adopted from the Walt Disney motion picture of Felix Salten's original story.

Perri was a little squirrel born in the hollow of an oak tree in a deep forest. In story and gay pictures in color by Dick Kelsey, the reader learns about the everyday life of a growing young squirrel. Perri had her moments of fun, play, and hunger. Danger was ever present as she dashed to and fro seeking to avoid other animals, cold, fire, flood, and lack of food.

This is recommended as an unusually attractive book for the elementary science book shelf.

Walt Disney's *Peter and the Wolf.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

Pre-school children will enjoy the pictures in color and having this well-known story read to them. Primary children will enjoy reading the story for themselves.

This book is one of the Walt Disney Mickey Mouse Club Books.

BEDFORD, ANNIE NORTH. *Walt Disney's Donald Duck and the Mouseketeers.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster. 1956. Unpaged. $0.25.

This Mickey Mouse Club Book is based on the Disneyland-Television show "A Day in the Life of Donald Duck." It takes you through a typical day with Donald at the studio. Children will thoroughly enjoy the pictures in color and the accompanying story.

Werner, Jane and the Staff of the Walt Disney Studio. *Walt Disney's Living Desert.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1954. 124 P. $2.95.

This True-Life Adventure is based on the film narration of the same title, considered one of the finest nature films ever filmed. This book catches much of the glamor, spirit, and brillance of the film itself. Walt Disney made the desert become alive and a thing of beauty for many thousands of people to whom it usually meant a sandy waste and something to drive past as rapidly as possible.

This book is full of color, suspense, and dramatic conflict. Certainly the desert has as varied a type of plant and animal life as one may find anywhere.

Living Desert like *Vanishing Prairie* is a book for any level and a fine book to have on any science book shelf.

Werner, Jane and the Staff of the Walt Disney Studio. *Walt Disney's Vanishing Prairie.* New York (630 Fifth Avenue, Rockefeller Center). Simon and Schuster, 1955. 124 P. $2.95.

Many readers well remember the Walt Disney film *Vanishing Prairie.* The photographs in color in this book are taken from the film and have suitable accompanying textual material. This is a True-Life Adventure story based on a great era in American human history, the settlement of the West. Thus in film and in story Walt Disney has tried to catch some of the spirit of the vanishing prairie. For more than two years the photographers rambled over the prairie's of America's West, shooting more than 200,000 feet of motion picture film and more than 3,000 still photographs as they trailed the animal life living there.

Vanishing Prairie is a highly recommended book for any age level—elementary grades, junior high school, secondary school, or adult.

Coombs, Charles. *Walt Disney's Westward Ho the Wagons.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 44 P. $1.00.

This story is based on the Walt Disney Motion Picture. Pictures in color and black and white are by the Walt Disney Studio. The interestingly told story, appropriately illustrated, will be enjoyed by many boys and girls and they will see how thoroughly enjoyable early American history can be!

Bedford, Annie North. *Walt Disney's Perri and Her Friends.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $.25.

Perri is a squirrel living in a tall tree deep in the big woods. Superb pictures in color and fine text make this an unusually fine *Little Golden Book.* Primary children will thoroughly enjoy this book.

Symposium. *Walt Disney's Mickey Mouse Club Annual.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 120 P. $1.50.

This Mickey Mouse Club Annual includes the best articles, stories, songs and games from the first four issues of *The Mickey Mouse Club Magazine.* It has just about everything in it—cartoons, songs, advice, fiction, science, beautiful photographs. There is an unusual amount of science—stories of plants, animals, and insects. Mickey Mouse fans will be delighted to have this memo book of stories, cartoons and photographs, all bound in permanent form.

Walt Disney's *Mickey Mouse Flies the Christmas Mail.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

Pre-school children will enjoy the pictures and the story and primary children will enjoy another Mickey Mouse story.

Walt Disney's *Mickey Mouse and the Missing Mouseketeers.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

Mickey Mouse himself daringly rescues his friends in time for the show, much to the joy of his friends. There are pictures in color and textual material for first or second graders.

Daly, Kathleen U. *Walt Disney's Mickey Mouse Club Stamp Book.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

In this Mickey Mouse Club Stamp Book are gathered some of the favorite Disney characters that appear in the movies and television shows. Separate gummed stamps may be placed in appropriate spaces near appropriate textual material.

Tenggren, Gustaf. *Jack and the Beanstalk.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

This Little Golden Book depicts the English Folk Tale *Jack and the Beanstalk* in pictures in color and appropriate reading material for first graders.

Hill, Monica. *Rin Tin Tin and the Lost Indian.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

Rusty and his pal Rin Tin Tin rescue an

Indian boy trapped by a fallen rock in a cave. Pictures in color by Hamilton Greene, plus a fine story make this an appealing *Little Golden Book* for primary children.

HILL, MONICA. *Gene Autry and Champion.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

This *Little Golden Book* tells about Gene Autry and his great horse, Champion, who are the heroes of an exciting story about a prairie fire and a home that was almost destroyed by the flames. Pictures in color are by Frank Bolle. First and second graders will really enjoy this story.

VERRAL, CHARLES SPAIN. *Annie Oakley, Sharpshooter.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1956. Unpaged. $0.25.

In this Little Golden Book story Tag gives a birthday party for his sister which turns out to be a surprise even for Tag. Pictures in color are by E. Joseph Dreany.

FLETCHER, STEFFI. *The Lone Ranger.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

The Lone Ranger and his famous horse, Silver, make their first *Little Golden Book* appearance in this exciting tale of a boy, a stagecoach, and a band of robbers. Boys and girls will enjoy this color-illustrated booklet.

GOTTLIEB, WILLIAM P. *Pal and Peter.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. Unpaged. $0.25.

Peter has a new puppy named Pal. He invites his friends to bring their pets to his pet party. They bring a rabbit, a parakeet, goldfish, canary, cat, turtle, kitten, big Dane, and a hamster. It is a lovely party. The beautiful pictures in color are a major part of this *Little Golden Book.*

SHIMEK, JOHN LYLE. *Cowboy Stamps.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $0.25.

This Little Golden Activity Book has stamps that may be placed in appropriate spaces opposite interesting stories about cowboys and their activities.

HUBERMAN, EDWARD. *Indian Stamps.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1957. Unpaged. $0.25.

This is a Little Golden Activity Book suitable for upper primary grades. Stamps are to be placed in appropriate places in the book opposite brief reading material relating to some phase of Indian life.

GOLDEN STAMP BOOKS. WHITE, ANNE TERRY, *Robinson Crusoe* and *King Arthur;* STERNE, EMILY, *Moby Dick;* HILL, MONICA, *Disneyland;* LINDQUEST, WILLIS, *Kit Carson* and *Animals of Africa.* New York (Rockefeller Center, 630 Fifth Avenue): Simon and Schuster, 1956. 48 P., 48 P., 48 P., 48 P., 32 P., and 32 P. each respectively. $0.50 each.

Each of these Golden Stamp Books has the same general plan. They are six titles of a long series of very popular Gold Stamp Books.

There is a story relating to a particular person, activity, or group with outline drawings in black that many youngsters so love to color. At appropriate places in the story are blank squares where appropriate gummed stamps found in the front of the book may be placed. Each stamp, which is in gay colors, is appropriately labeled and depicts a certain event, animal, and so on, can be removed and placed in the appropriate space. The stamps have perforated margins for ease of removing.

Boys and girls learn a lot of information from the textual material and the interesting pictures on each stamp, and gain this in a way that seems always to be interesting and challenging to them. For example, in the above series the stories of Animals of Africa are very well done and each picture stamp tells a story and has an appeal of its own.

WERNER, JANE, *The Golden Book of Bible Stamps;* FORD, THOMAS K., *The Golden Stamp Book of Presidents of the United States;* EATON, JEANETTE, *The Golden Stamp Book of George Washington;* SHAPIRO, IRWIN, *The Golden Stamp Book of Abraham Lincoln;* WYLER, ROSE, AND AMES, GERALD, *The Golden Play Book Animals of the Past Stamps;* KOEHLER, IRMENGARDE EBERLE, *The Golden Stamp Book of Napoleon;* COOKE, DAVID, *The Golden Play Book of Transportation Stamps;* LAWNSBERY, ELOISE, *The Golden Stamp Book of Marco Polo;* BERHARD, HUBERT,, *The Golden Play Book of Wonders of Space Stamps;* SHAPIRO, IRWIN, *The Golden Stamp Book of Westward Ho;* AND SOIFER, MARGARET, *The Golden Stamp Book of Early Man.* New York (630 Fifth Avenue, Rockefeller Center): Simon and Schuster, 1954, 1955. 48 P. Each $0.50.

The above eleven titles are part of a series of the famous Simon and Schuster *Golden Stamp Books.* At the beginning of each book is a series 48 perforated stamps ready to be detached and be pasted in the appropriate space as the reader reads the textual material and determines which particular stamp is to be pasted in the indicated space. The textual material has been carefully selected and gives the reader a vast amount of interesting information. Even this part of the booklet is most worthwhile in itself and the pictures on the stamp in color are also quite interesting and educative.

Young children should find this a most valu-

able work—supplementary reader—whether interested in stamp collecting or not. Young stamp collectors will be thrilled with these books. Teachers may use these most attractive books effectively as supplementary readers and activity booklets.

Todd, Colonel Frederick P. *Soldier Stamps.* New York (Rockefeller Center): Simon and Schuster, 1957. 48 P. $0.50

This Golden Stamp Book presents soldiers of the world in their authentic uniforms from early history to the present. There are 72 stamps in color and line drawings of arms and equipment.

Appropriate textual material is presented in chronological order with space for the proper stamp to be pasted. The oldest stamps show a soldier of Persia in 400 B.C. and a soldier of the Roman Empire 400 A.D.

The textual material and the drawings present interesting material of soldiers in the past and their equipment.

White, Anne Terry. *All About Stars.* New York (457 Madison Avenue): Random House, Inc., 1954. 144 P. $1.95.

The Random House *Allabout Books* have been very popular with teenage readers and teachers. They are excellent additions to the junior and senior high school science book shelf. Junior high and elementary teachers find them excellent sources of accurate supplementary material in various aspects of science.

All About Stars is a fine introduction to the study of astronomy. Excellent illustrations accompany the accurate, interestingly written reading material. The story of the solar system and the stars is simply told. Astronomy is a science that youngsters find very interesting. Questions and things teen-agers often wonder about are well answered in *All About Stars.*

Tannehill, Ivan Ray. *All About the Weather.* New York (457 Madison Avenue): Random House, Inc. 148 P. $1.95.

Weather is where you find it and the winds blow where they listeth. No other phase of his environment so affects man's activities, his food habits, the clothing he wears as does weather. Everybody talks about it but few can readily explain it and still fewer can forecast it.

North America's Number 1 Weather Forecaster, Director, Reporting and Forecasting, U. S. Weather Bureau explains the changes in weather and how to forecast them in this *Allabout* book.

Unusual weather-long dry spells, floods, blizzards, tornadoes, hurricanes, typhoons, hail and snowstorms attract newspaper, radio, and television reports.

Weather forecasting is now an important science with weather bureaus and observers everywhere across the land, using the most advanced scientific methods in forecasting—amply supported by the federal government.

With many two-color illustrations, the author explains how to observe weather, how forecasts are made, how to read weather maps, weather bureau instruments, kinds of clouds, causes of different kinds of precipitation, different kinds of storms, and so on.

Boys and girls 9 to 12 years old can read the book. It is recommended for the grammar grade and junior high school science book shelf.

Andrews, Roy Chapman. *All About Whales.* New York (457 Madison Avenue): Random House, Inc., 1954. 148 P. $1.95.

All About Whales is a most interesting book that will be enjoyed by boys and girls 10 to 14 years old. It is another *Allabout* book that will make an excelelnt addition to the science book shelf. The author is former Director of the American Museum of Natural History and one of America's best science writers. This book is based upon his experiences in whale hunting and his work on whales in the American Museum of Natural History. Dr. Andrews has been on many whale hunts and has scientifically studied the strange habits of every kind of whale.

Whales are the largest animals that have ever inhabited the earth. Whaling has long been one of man's most important and thrilling occupations. Whaling is still a very important industry.

Gould, Jack. *All About Radio and Television.* New York (457 Madison Avenue): Random House, Inc. 143 P. $1.95.

This *Allabout* book should prove very popular with youngsters 9 to 12 years old, especially boys. In simple language and numerous two color illustrations, the author explains the principles of radio and television, and how each operates. The author explains in detail how a working, simple radio set can be made by a ten-year old youngster from a few very inexpensive materials. A lot of boys reading this book will soon be doing just that.

The operation and working of a television set are also explained quite simply. The last chapter tells about the operation of radio-telephones on police cars, taxis, ships, airplanes, and so on, the walkie-talkie, and radar.

This is a fine book for the grammar grade, junior high school, and high school science book shelf.

Lane, Ferdinand C. *All About the Insect World.* New York (457 Madison Avenue): Random House, Inc., 1954. 141 P. $1.95.

This is another *Allabout* book written by a well-known authority in the field. Tales of magicians and sorcerers seem dull besides the reports of scientists who have studied the insect world with its billions of inhabitants. The

insect world is truly a believe-it-or-not world with grotesque, terrifying, dazzlingly beautiful, exotic creatures.

Many insects do have strange life cycles indeed, strange homes, bizarre means of protection, strange devices of defense and offense.

There is a beetle so small it can crawl through the eye of the finest needle and its cousin so large it's outstretched legs would cover a good sized plate. A termite queen may live 50 years and the May fly lives only a day. A dragonfly eye may have as many as 25,000 lens, and some bees "air-condition" their homes. Some 700,000 species of insects amaze and baffle mankind.

The book is suitable for boys and girls 10 to 14 years old and will make an excellent addition to the junior high and senior high science book shelf.

LANE, FERDINAND C. *All About the Sea.* New York (457 Madison Avenue): Random House, Inc. 148 P. $1.95.

This *Allabout* book describes the wonders of mysterious sea—how the sea was formed, before there were seas, mountains under the seas, volcanic cones sticking out of the seas, unknown ocean depths, pastures in the seas, ocean currents, mineral resources, ocean tides, strange inhabitants of the sea (plant and animal). There are numerous two color illustrations. Many readers will recall the author's earlier *The Mysterious Sea.*

Boys and girls aged 9 to 12 can readily read and enjoy this book. It is recommended for the grammar grade and junior high school science book shelf.

POUGH, FREDERICK H. *All About Volcanoes and Earthquakes.* New York (457 Madison Avenue): Random House, Inc. 150 P. $1.95.

This is one of the better books in the outstanding *Allabout Books.* Boys and girls aged 9 to 12 will be able to read and understand this book.

Volcanoes and earthquakes have always awed and terrified the human race. They have been and can be terrifying phenomena for those near them or experiencing them. No wonder man has always been interested in volcanoes and earthquakes. This book explains the why and where of volcanoes and earthquakes. It tells about some famous ones—Mt. Vesuvius, Mt. Etna, Mt. Pele, Mt. Lassen, Pompeii and Herculanean, Krakatoa, Crater Lake, Paricutin, and so on.

The causes, results, and probability of volcanoes and earthquakes are explained. Two-color illustrations supplement the textual material.

This is a recommended book for the grammar grade and junior high school science book shelf.

ANDREWS, ROY CHAPMAN. *All About Dinosaurs.* New York (457 Madison Avenue): Random House, Inc. 146 P. $1.95.

A world famous scientist tells about hunting dinosaurs with a whisk broom, about the Thunder Lizard that weighed 80,000 pounds, about armored dinosaurs, flying dragons, and sea serpents that lived 100 million years ago. Dinosaurs were the strangest animals that ever lived on the earth. No human beings ever saw them, for they lived millions of years before man came on earth. We know about them only by their footprints in stone and their bones buried in the ground.

Although varying in size from over 80 feet long and 20 feet or so high, weighing 40 or 50 tons, to jack-rabbit in size, they all reproduced by laying eggs—eggs which have been found in the Gobi Desert in China.

Two-color illustrations add much to the understanding and appreciation of this unusually find *Allabout* book. The book is suitable for boys and girls aged 9 to 12 and is recommended for the grammar grade and junior high school science book shelf.

FREEMAN, IRA M. *All About the Wonders of Chemistry.* New York (457 Madison Avenue): Random House, Inc., 1954. 148 P. $1.95.

This is one of the Random House popular *Allabout Books.* Boys and girls aged 10 to 14 will find this a most readable account of the wonders of chemistry. This particular book is written by one of America's best writers in the juvenile science field. Numerous two-color illustrations are an integral part of the book.

This book tells about the beginnings of chemistry, atoms and molecules, oil, steel, metals, fuels, drugs, fibers and plastics, rubber, insecticides, and so on.

This is an excellent book for the junior high-senior high school science library.

ZIM, HERBERT S. *The Big Cats.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 64 P. $2.00.

No wonder it was high praise to say of a pioneer that he could lick his weight in wildcats. The big cats—lions, tigers, leopards, cheetahs, jaguars, cougars, and ocelots—are the most independent, the toughest, and the most cunning of all hunting animals. They are also beautiful creatures, with every part of the body perfectly coordinated.

Dr. Zim discusses the cat's highly specialized characteristics and describes each of the major species in detail. Black and white drawings by Gardell D. Christensen make the cats come alive.

This *Morrow Junior* book is suitable for 8 to 12 year olds and would be an excellent addition to the elementary science library.

ZIM, HERBERT S. *Monkeys.* New York (425 Fourth Avenue): William Morrow and Company, 1955. Unpaged $2.00.

Monkeys seem to be the most fascinating of all animals to many people. Monkey Island in Chicago and Monkey Jungle in Miami,

Florida are nearly always surrounded by large groups of children and adults. Possibly this is because man sees in monkeys small living reflections of himself. But monkeys are not mere imitations of man. They form an important and distinct group of mammals in themselves.

This *Morrow Junior* Book is one of Zim's many excellent books in science. In textual material and fine black and white drawings by Gardell D. Christensen, monkeys become so realistic one can almost hear them chatter. This book tells about all of the different kinds of monkeys and their relatives, where they live, what they eat, what they do, and so on. The last part of the book even gives suggestions about selecting and caring for pet monkeys.

The book is suitable for all age groups. It is recommended as a fine science book for the intermediate—grammar grade level science book shelf.

Zim, Herbert S. *Comets.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 64 P. $2.25.

Comets are the largest members of the solar system. For centuries the spectacular and unpredictable appearance of comets, seemingly close to the earth, terrified people throughout the world. Some people are still frightened by them. However we know much about them and have little or no reason to be frightened by them.

Dr. Zim in this beautifully illustrated book explains many things about these unusual visitors from the vicinity of Jupiter. There is brief discussion on the relations of comets and meteors.

Comets is suitable for boys and girls 8 to 12 years of age and is a fine addition to the elementary science book shelf.

Zim, Herbert S. *Our Senses and How They Work.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 64 P. $2.00.

Our senses have been called the windows of the mind, for it is by means of our major sense organs that we become aware of the world around us.

We do not know exactly how many senses we have—authorities are not agreed on this. Seeing, hearing, tasting, smelling, and touch are the five major and oldest known ones. There are others such as hunger, pain, thirst, direction, balance, and probably many more.

Supplemented by pertinent pictures and diagrams, Dr. Zim explains each of the five major senses in some detail with some attention paid to the lesser senses. Nerve impulses travel at about 50 feet a second from the sense organ to the brain.

This book is suitable for 8 to 12 year olds and is an excellent addition to the science library as are all of the numerous Zim science books. In fact a science library made up only of Zim books would be an excellent one, quite complete in itself!

Zim, Herbert S. *Your Food and You.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 64 P. $2.50.

A lot of Americans take food for granted. They have to think about it only when they are buying it or are hungry. Many people find the study of food a fascinating subject. In this brief survey, intended and designed for 8-to-12-year olds, Dr. Zim explains why we need it, what food is composed of, how we digest it, what it does for us, and a great deal more.

There is wisdom as well as all sorts of valuable information in this skillfully planned and illustrated book. Illustrations in black-and white are by Gustav Schrotter.

This is an excellent book for the grade-school or junior-high-school science book shelf.

Earle, Olive L. *Paws, Hoofs, and Flippers.* New York (425 Fourth Avenue): William Morrow and Company, 1954. 192 P. $3.50.

This book tells about animals from a somewhat unusual angle—their feet. The feet of different animals are quite different and often they serve unique purposes in addition to the common one of locomotion. Miss Earle says "An animal's feet are often an important clue to his order and tell a great deal about the way he lives. Separating the orders according to the types of feet is an interesting way to study animals." Using their claws, hoofs, flippers, and nails to classify them, she gives the significant facts, as well as many unusual and interesting details, about representatives of every order of mammals.

Black and white illustrations by the author add much interest to the textual material.

This book by a distinguished artist-naturalist is recommended as an excellent addition for the science book shelf—elementary, general science, or biology.

Earle, Olive L. *The Octopus.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 64 P. $2.00.

Because of his glaring eyes and coiling arms, the octopus has a ferocious appearance. Actually most varieties are timid and harmless. This book describes the long rubbery arms with their suckers, how they propel themselves through the water, using the same principle that operates the jet plane. The food, home, and color changes of the octopus are also described.

They escape from their enemies in a dark cloud of their own making.

The book also gives detailed information about the squids, the cuttlefish, the chambered nautilus, the argonaut, and the spirula—all relatives of the octopus.

Many excellent black and white illustrations by the author supplement the textual material. This *Morrow Junior* book would be an excellent

addition to the elementary science, general science, or biology science book shelf, or as a reference for teachers in these areas.

EARLE, OLIVE L. *The Swans of Willow Pond.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 64 P. $2.00.

The Swans of Willow Pond is another delightful story by the author of many fine elementary science books such as *Robins in the Garden,* and *Thunder Wings.*

Willow Pond was exactly right for a swan nursery. So in this pond the reader learns about the life of a swan during a year of its life. The beautiful drawings are by the author. The book is suitable for children 6 to 10 years old. This is a fine addition to the elementary science book shelf.

EARLE, OLIVE L. *Crickets.* New York (425 Fourth Avenue): William Morrow and Company, Inc. 1956. Unpaged. $2.00.

Anyone who has spent a summer in the country has probably heard the chirping of crickets. Charles Dickens once wrote "To have a cricket on the hearth is the luckiest thing in the world!"

Miss Earle is a naturalist as well as an artist and has beautifully illustrated her own book. She explains the development of crickets, their anatomy, feeding habits, activities, where they live, and the various kinds. Finally she explains exactly how to keep a cricket as a pet.

This is an excellent book for the science book shelf. It is suitable for eight to twelve year olds.

EARLE, OLIVE L. *Mice at Home and Afield.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 64 P. $2.25.

Countless mice live on earth. Most people dislike them because the house mouse is an inveterate thief and tears almost anything to shreds to make a nice bed for the babies. House mice are not a native of America but came here with the first settlers.

The book describes the many varieties of mice, their physical features, nests, habits, enemies. The house mouse may have eight litters in a year, averaging five babies. The book is illustrated by the author.

This *Morrow Junior* book is suitable for 8 to 12 year olds.

SELSAM, MILLICENT E. *The Plants We Eat.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 125 P. $2.50.

All life, including human depends upon plants. *The Plants We Eat* tells the interesting story of the development of our common food plants, their history, and their changing uses. Cabbage, Kale, Collards, Brussells Sprouts, Broccoli, and Cauliflower all were developed from wild cabbage.

For over 400,000 years our prehistoric ancestors merely gathered food. They tried out all parts of the plants—berries, fruit, seed, leaves, roots. They learned which tasted good and which were bitter, which ones kept them healthy and which ones made them sick.

Probably about 10,000 years ago man started the purposeful raising of plants for food. The beginning of agriculture was the beginning of civilization. People began to settle down in one place and to grow their own food, to live in groups and build cities.

Sections of this book are devoted to the roots we eat other sections to stems, leaves, flowers, fruits, and cereals.

Altogether this is an unusually fine book and is highly recommended as a fine reference or supplementary reading book for elementary science and biology teachers and for the elementary science book shelf.

SELSAM, MILLICENT E. *Play with Seeds.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 96 P. $2.50.

Play with Seeds is another fine science book by Millicent Selsam. Earlier similarly titled books were *Play with Leaves and Flowers, Play with Plants, Play with Trees, and Play with Vines.*

This book suitable for ten-to-fourteen-year olds is the fascinating story of seeds. Each year the miracle seeds come to life and the process of life continues on. All sorts of seeds are described, how flowers produce seeds, how seeds travel, uses of seeds, and experiments with seeds. Many readers will learn a lot about seeds from this book.

The book is well illustrated in black and white by Helen Ludwig.

This is an excellent reference book for elementary science teachers and the science book shelf.

GOETZ, DELIA. *Deserts.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 64 P. $2.00.

Deserts are much alike everywhere but each is different from any other. This book discusses the causes of deserts, the chief characteristics of deserts, the type of plant and animal life found there, and how this life along with man adapts itself to a desert existence. Water is the secret of the desert. After a rain, the desert flowers like a garden.

The book is beautifully illustrated in color by Louis Darling. This is a fine book for the elementary science book shelf. The book is suitable reading for 8 to 12 year olds.

GOETZ, DELIA. *Tropical Rain Forests.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 64 P. $2.50.

This Morrow Junior Book is suitable for eight-to-twelve year olds.

The tropical rain forests stretch along the equator in South America, Africa, India, Burma and the Dutch East Indies—the longest stretch being the 2300 miles from the Andes to the mouth of the Amazon.

This book describes the teeming life of this steaming, dripping rainbelt with its monstrous vegetation, the strange birds, beasts, and insects, the primitive people. The author also shows how times are slowly changing now for these backward people and the enormous value of the products found there.

Beautiful illustrations in color by Louis Darling make this a most attractive book. It is recommended as a fine book for the elementary school science book shelf.

Darling, Louis. *Chickens and How to Raise Them.* New York (425 Fourth Avenue): William Morrow and Company, Inc., 1955. 63 P. $2.00.

Although the title sounds like that of a textbook, it is not that. However it is a practical book and the advice given could well be used by the beginning chicken raiser. It is a fine book about very interesting farm bird and could as readily be used as a delightful story for reading and as a reference book in the upper elementary grades. The book is based on the author's own experiences. It is profusely and decoratively illustrated.

Darling, Louis. *Seals and Walruses.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 63 P. $2.00.

Each year half a million baby fur seals are born on the rocky shores of the Pribilof Islands far North in the Bearing Sea. Because of their valuable fur, these seals are the most prized of all seals. They range the seas from the Arctic to the Antarctic, returning each June to the breeding grounds of the Pribilof Islands.

The special traits of other varieties of seals, sea lions, and walruses also are vividly described by Mr. Darling. Splendid drawings by Mr. Darling supplement the textural material.

This *Morrow Junior Book* is a fine book by a noted wildlife naturalist. It is recommended as a fine edition to the grammar grade-Junior high school science library.

Darling, Louis. *Penguins.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 64 P. $2.00.

Penguins are strange birds. They never fly and spend nearly all of their life in the ocean water—except when they wade ashore to spend the breeding season. It is a strong, fast swimmer. A layer of fat and specially constructed feathers keep them warm.

There are seventeen species of penguins—all found south of the equator, but all the way from Antarctica to Galapagos Islands near the equator. The great emperor penguin is the largest, weighing as much as seventy pounds. The Galapagos penguin is the smallest—weighing only four or five pounds. They can live only in cold water and are widely distributed on lands around Antarctica and southern South Africa and southern South America. The penguin is master of his environment.

The book is beautifully illustrated by the author. The book is suitable for all grade levels and can be read readily by most eight to twelve year olds. It is a fine book for the elementary science book shelf. Readers will remember the author's earlier *Greenhead* and *Seals and Walruses.*

McClung, Robert M. *Green Darner.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 48 P. $2.00.

Green Darner is the story of a dragonfly. Green Darner is the biggest of the dragonflies that frequent the pond. About three inches long, he is known also as "darning needle," "horse stinger," and "snake doctor."

The author traces the life story of the dragonfly—how it develops, what it eats, its enemies, and its everyday activities. Illustrations in color and black and white are by the author.

The book would make a fine addition to the elementary science book shelf. The reading material is suitable for six to ten year olds. This is Mr. McClung's tenth book—all reviewed previously in *Science Education.* Each of the other nine titles are equally suitable for the elementary science book shelf.

McClung, Robert M. *Vulcan: The Story of a Bald Eagle.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 64 P. $2.00.

Vulcan was born in the crown of a high tree in the Northern wilderness. The author traces his everyday life adventures from baby hood until he becomes a full-fledged adult. Vulcan's adventures are sufficiently exciting to keep the interest of most boys and girls.

This is a fine book for the upper grade or Junior high school elementary science book shelf.

McClung, Robert M. *Major: The Story of a Black Bear.* New York (425 Fourth Avenue): William Morrow and Company, Inc., 1956. 64 P. $2.00.

Major was born in a warm den under the roots of a dead tree while the snow lay deep in the Northland forest. The delightfully told, accurate story of Major tells about his growth and everyday life adventures from a stumbling cub to a full-grown animal weighing more than 400 pounds. The many adventures of Major, many amusing and often life-endangering, will hold the reading interest of many boys and girls.

The book is suitable for boys and girls from ages 8 up to 12 or beyond and would be a fine

book to have on the elementary science book shelf.

A number of Mr. McClung's fine science books have been reviewed in *Science Education: Vulcan: The Story of the Bald Eagle; Bufo: the Story of a Toad; Tiger: the Story of a Swallowtail Butterfly; Spike: the Story of a Whitetail Deer; Stripe: the Story of a Chipmunk; Ruby Throat: the Story of a Hummingbird;* and *Sphinx: the Story of a Caterpillar.*

MCCLUNG, ROBERT M. *Luna.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 48 P. $2.50.

Luna is the story of a moth from its development from the egg to an adult moth. What happens at various stages is told in this story suitable for primary grade children. The book is beautifully illustrated in black-and-white and in color by the author. The pale-green Luna moth in its etheral beauty mirrors the changing seasons.

This is the twelfth book by the author in a long series of superb nature books written for children. This is a fine book for the elementary science book shelf.

MCCLUNG, ROBERT M. *Leaper.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 64 P. $2.50.

Leaper is the story of an Atlantic salmon. The story traces Leaper's development from a pink salmon egg in a quiet pool through his journey two years later down a fast moving stream to the ocean. Three years later Leaper has a strange urge to return to the stream where he was hatched. Getting back up stream was a difficult and hazardous task. Finally he entered the pool where he was born. Hazards and enemies dogged his footsteps all the five years of his life.

Altogether the life cycle of a salmon is one of the most dramatic stories in nature, and a reader will follow this dramatic story of Leaper with the keenest of interest. Many artistic illustrations by the author supplement the textual material.

This book is recommended as a fine book for the elementary science book shelf.

RIPPER, CHARLES L. *Hawks.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 64 P. $2.00.

Hawks have long been symbols of courage and strength. They are noted for powerful flight, courage and strength, and keen sight. The bald eagle, a close relative of the hawk, is the emblem of the United States.

This book tells about the various kind of hawks, their physical features, food and resting habits, and migratory habits. A certain valley in Pennsylvania is a favorite route for hawks. Some hawks may reach a velocity of 150 miles per hour in its dive. No one can be sure how powerful a hawk's eyes are, but from a treetop or circling the sky, it can spot a little brown mouse scampering through the grass.

Impressive black and white illustrations add much to the attractiveness and understanding of the textual material.

The book is recommended for the elementary science book shelf. The book is suitable for ten-to-fourteen year old.

RIPPER, CHARLES L. *Moles and Shrews.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 64 P. $2.50.

Moles and Shrews follow the author's earlier *Bats* and *Hawks,* two widely-acclaimed junior books. Moles and shrews are two of man's important helpers, yet many people consider them pests. A mole will devour thirty pounds of insects, grubs, and cutworms in a single year. Many interesting characteristics of moles and shrews are described.

There are many excellent pictures by the author supplementing the textual material.

The book is highly recommended for ten-to-fourteen year olds and for the science book shelf.

MASON, GEORGE F. *Animal Clothing.* New York (425 Fourth Avenue): William Morrow and Company, Inc., 1955. 94 P. $2.00.

Animal Clothing is one of the noted *Morrow Junior* books series. It is suitable for youngsters ten-to-fourteen years of age. The author tells about the different protective coverings given by nature to all living creatures except man.

Some animals have fur, others hair, feathers, scales, shells, chitin, armor. Wide variations are found among these various protective coverings. The book is illustrated with black and white drawings by the author. This book is recommended as a fine addition to the science library. Earlier books by Mr. Mason include *Animal Tracks, Animal Homes, Animal Sounds, Animal Weapons,* and *Animal Tools.*

BUEHR, WALTER. *Harvest of the Sea.* New York (425 Fourth Avenue): William Morrow and Company, Inc., 1955. 96 P. $2.50.

Fish have always been a very important part of man's food supply. Since earliest times men have used hook, spear, and nets to catch fish—as well as many strange and unusual methods. Mechanical power and refrigeration have revolutionalized the fishing industry.

This book describes the kinds of fish caught and the methods of catching fish from early colonial times down to the present. Numerous maps and illustrations supplement the textual material.

This is a good book for upper grade and junior high school readers and as reference source in the school library on commercial fish and commercial fishing.

Kettelkamp, Larry. *The Magic of Sound.* New York (425 Fourth Avenue): William Morrow and Company, 1956. 64 P. $2.00.

This book, illustrated by the author, explains how sounds are produced, how sounds are captured, echoes and "silent" sounds, and how artificial sounds are produced—the latter used especially in radio and television. Many experiments are described which pupils can do themselves in producing sounds, capturing sounds, and producing artificial sounds.

The book is an excellent book for the elementary science book shelf and is suitable for eighty-to-twelve year olds.

Many readers will recall the author's *Magic Made Easy* and *Spooky Magic.*

Kettlekamp, Larry. *Shadows.* New York (425 Fourth Avenue): William Morrow and Company, 1957. 64 P. $2.50.

Many readers will recall the author's earlier fine book *The Magic of Sound.* This is equally good. Children (and adults, too) are always interested in shadows. Shadows are intriguing—as witness lunar and solar eclipeses. Shadows have practical uses, too—in aerial photographs, in slides, in movies.

The author describes many things that can be done with shadows. Children will delight in producing similar shadows themselves.

The book is suitable for eight-to-twelve-year olds and would make a most popular book on the elementary science book shelf.

Beim, Jerrold. *Laugh and Cry.* New York (425 Fourth Avenue): William Morrow and Company, 1955. 47 P. $2.00.

This is a book on your emotions and how they work. Emotions are wonderful things. Without them we would be as blank as puppets. But uncontrolled emotions can cause a world of trouble.

Anger! Fear! Love! Sorrow! Joy! All come to the five children of the Jones family. Young readers will here find a clear, simple introduction to this vital subject. The differences between useful and harmful emotions are discussed and it is pointed out even harmful emotions can sometimes be used constructively.

Illustrations in color by Ray Campbell add much to an understanding of the book.

This *Morrow Junior* book is suitable for 8 to 10 year olds and would make an excellent addition to the reading shelf.

Mr. Beim is the author of nearly twenty books for elementary school level boys and girls.

Krum, Charlotte. *Read with Me.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. Unpaged. $1.00.

A gayly colored book for beginning first-graders. A few words in large type for a beginner included in the text of each lilting nursery story and rhyme.

Coblentz, Catherine Cate. *Martin and Abraham Lincoln.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. Unpaged. $1.00.

This is a charming story based on a true incident from the life of Lincoln. It gives an authentic picture of the nation's capital in the 1860's.

Martin Emery was the oldest of several children who lived with their mother near Washington. The father was a prisoner in Andersonville prison. Martin felt a lot of responsibility for getting food for the family but was too young to do much about it.

One day he went with Snowden, a colored man who peddled fruit and vegetables, into Washington. While waiting for Snowden to make his rounds, Lincoln comes along and talks to Martin who immediately recognizes he is the President.

Read this delightful story for primary graders to find out what the two talked about! This is an excellent book for the primary reading shelf.

Witty, Paul, and Kohler, Julilly. *You and The Constitution of The United States.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. 57 P. $1.50.

Here's a fine book for upper grade and junior highers (or even adults) which includes Graham Finney's prize-winning essay, "What America Means to Me," the sequence of events leading to the drafting of the Constitution, including the major controversies and their solution. Also included is the substance of the seven original articles and the Bill of Rights in simple text and pictures and the full text of the Constitution of the United States. Pictures are by Lois Fisher.

Here is a *must* book for the school book shelf.

Schwalbach, James. *Fun-time Crafts.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. Unpaged. $1.25.

This is a creative book with suggestions of how to make 100 things out of materials at hand—macaroni, corks, paper bags, bottle tops, old bats, screws, cans, and so on. It is hoped that the child will be encouraged to develop his creative ability and to express himself artistically.

Numerous illustrations in color and black-and-white adds much to the usefulness of the book.

Fisher, Lois. *Bible Picture Stories.* Chicago (Jackson Boulevard at Racine): Children's Press, 1955. 30 P.

This is an unusually fine book for children telling in unusual illustrations and appropriate text the story of Moses, Balaam, Joshua, Samson, Samuel, Ruth, and David. The stories were presented on television on a San Francisco station. Through these stories with their fine illustrations children can readily grasp and understand the main events in the lives of some great characters of the Bible.

TRUE, LOUISE. *Number Men.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. Unpaged.

This is a beginner's number book, using poems to enable the reader to recognize, write, and name numbers up to ten. There are pictures in color by Lillian Owens.

MARTINI, TERI. *The True Book of Indians.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. 47 P. $2.00.

Here's a story about Indians before settlers came to this country. It tells about Indians of the seacoast, the plains, the deserts, the swamps, and the woodlands.

This book for beginning readers has pictures in color and black-and-white by Charles Heston. This book is a fine book for introducing youngsters to Indian life.

SCHLEIN, MIRIAM. *City Boy, Country Boy.* Chicago (Jackson Boulevard at Racine): Children's Press. 1955. Unpaged.

The Country boy tells what he likes and loves about the Country. The City boy tells what he likes and loves about the City. Then the Country boy goes to the city and the city boy goes to the country. Each one likes it there, too! Gay illustrations in color make this a most attractive book. It is a fine book for the primary grade book shelf.

SHERMAN, ELIZABETH. *Merry Music Makers.* Chicago (Jackson Blvd. and Racine Avenue): Children's Press. Unpaged. $1.00.

This is an introduction to musical instruments in gay, colorful pictures and appropriate text. It is hoped the book will encourage beginners to enjoy music by taking an active part in it. The book is suitable for primary-grade children.

WILLIS, RICHARD, AND IRENE. *Rosie's Josie.* Chicago (Jackson Boulevard at Racine): Children's Press, 1955. Unpaged.

Rosie was really Rosario Antonio Cesare Giuseppe Cucina and Josie was his tired car which had carried groceries up and down hill for many, many years. For you see Rosie had a resturant and cooked all kinds of wonderful food in the kitchen.

This book in colorful, gay pictures, rhyme, verse, and prose tells all about Rosie's kitchen and Josie, the antiquated car. But one day Josie stopped on the middle of the hill.

Primary youngsters will love the gay pictures and this unusual story.

BIALK, ELISA. *Tizz.* Chicago (Jackson Boulevard at Racine): Children's Press, 1955. 96 P. $2.50.

Tizz is a pony, mischievous and honey colored, a delightful surprise for the Hill children from their grandmother.

It takes a reluctant father, a cooperative grandmother, a cub Scout troop and a large group of grade school children to get Tizz out of trouble and help a lonely girl Tracy make friends in a new neighborhood.

Tizz is a good pony story against a background of family relationships.

The book is suitable for sevn-to-ten years olds. Children will really love this story!

BIALK, ELISA. *Tizz Takes a Trip.* Chicago: Children's Press, 1956. 96 P. $2.50.

This is another story about the lovable, mischievous pony Tizz. In this story Tizz becomes quite cooperative. Tracy and Don and Tizz, and Mr. and Mrs. Hill have a great time with a paper route, a visit to Grandma's, a visit to the Pony Farm, and the Hill square dance.

Children will be as enthusiastic about this new story as the one reviewed above.

HAVEL, VICTOR. *Fun-Time Magic.* Chicago (Jackson Boulevard at Racine): Children's Press, 1955. Unpaged. $1.50.

Any child loves a little hocus-pocus, especially if it enables him to do something others cannot do.

Simple directions encourage a child to read, and graphic pictures clarify the now-you-see-it, now-you-don't skill of a young magician.

The tricks use materials commonly found around the home—string, buttons, toothpicks, coins, glasses, and so on.

The book is a fine book for seven-to-ten year olds and for the elementary science book shelf.

BROEKEL, RAY. *The True Book of Tropical Fishes.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. 47 P. $2.00.

Tropical fish interest most young children. Here, for beginners, is a fine introduction with well organized, constructive information about the kinds and needs of fresh-water tropical fishes. The text, simple enough for young readers, is enhanced with black and white as well as colored illustrations. Ninety-eight per cent of the text is in the combined word List for Primary Reading.

This is a recommended book for the primary science book shelf.

BROEKEL, RAY. *You and the Sciences of Mankind.* Chicago (Racine at Jackson): Children's Press, 1956. 61 P. $2.00.

Only within about the last hundred years, the sciences that deal with man as a living and cultural being have developed, grown, and been divided into many specialized sciences. This book names and explains these human sciences. Through diagrams and textual material the various human sciences are discussed and their rela-

tionships shown. The older sciences of mathematics and philosophy are included.

Boys and girls 11-to-14 years old can read the book understandingly. The book is suitable for junior high school and secondary school libraries.

BROEKEL, RAY. *You and the Sciences of Plants, Animals, and the Earth.* Chicago (Racine at Jackson): Children's Press, 1956. 61 P. $2.00.

This book by illustrations and textual material defines the various subdivisions of the science of plants, animals, and the earth and shows how the various subdivisions are related. The book explains what people do who work in these various fields.

The book is suitable for 11-to-14 year olds and would make a fine addition to the junior high school or secondary school library or science shelf.

PODENDORF, ILLA. *The True Book of Animals of the Sea and Shore.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. 47 P. $2.00.

This is one of the well known *True Book* series intended for primary children. There are fascinating illustrations in color and in black and white by Chauncey Maltman. The author, Illa Podendorf is a well-known science teacher at the Laboratory School of the University of Chicago.

This is a fine book for the primary science book shelf.

PODENDORF, ILLA. *The True Book of More Science Experiments.* Chicago (Racine at Jackson): Children's Press, 1956. 47 P. $2.00.

This book for primary children six to eight years old supplements the earlier book by the same author *Science Experiments.*

The simple experiments in this book are in the general area of Light, Work, Inertia, Ice, Water, and Water Vapor. Through action, observation and repetition children are introduced to basic principles of science.

The book is illustrated in color by Chauncey Maltman. It is highly recommended for the primary science book shelf.

STORM, MARK. *Gruyo of the Flying H.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. 96 P. $2.50.

This is the story of a boy and a horse growing up together. There are set-backs and triumphs for each of them, but each grows up a credit to the other.

Gruyo, a cinder-gray colt, was described by the owner of the Flying H as the "mangiest, no-account hunk of fleabitten critter" he had ever seen. Keenly disappointed in not getting the golden palomino he expected, the rancher gives it to a nine-year old Mexican boy who lives on the ranch.

Children from eight-to-twelve years of age will enjoy the fine story. The author spent his boyhood on a southwest ranch and is now a well known artist. He himself did the eye-catching illustrations in black-and-white.

GREENE, CARLA. *I Want to be an Orange Grower.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. Unpaged. $2.00.

This is a first-grade "I Want to Be" book. Illustrations in color are by Audrey Williamson. Dr. Paul Witty, Director of the Psycho-Educational clinic at Northwestern University served as consultant for "I Want to Be" series.

Jimmy learns how citrus fruits are grown—how the trees are cared for, the fruit picked and processed, and packed and shipped. Jimmy learns a great deal about what an orange-grower does.

GREENE, CARLA. *I Want to be a Train Engineer.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. Unpaged. $2.00.

In this first-grade book Tommy learns about the work of a train-engineer. He also learns a lot about trains and different kinds of cars.

Most boys at some time in their life dream of becoming a train engineer. This "I Want to Be" book is illustrated by Victor Havel.

GREENE, CARLA. *I Want to Be an Animal Doctor.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. Unpaged. $2.00.

This "I Want to Be" book tells about the work of a veterinarian. Dick learns it takes a lot of work and love for animals to become a good animal doctor.

Frances Eckart's gay pictures tell first-graders a lot about the work of animal doctors.

GREENE, CARLA. *I Want to Be a Baker.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. Unpaged. $2.00.

This first-grade "I Want to Be" book tells about the work of a baker. Bakers have to develop a lot of skills, but their work is interesting and pays unusually well.

The color illustrations are by Audry Williamson.

WITTY, PAUL. *The True Book of Freedom and Our U. S. Family.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. Unpaged. $2.00.

This is an introduction for primary-grade children toward an initial understanding of what freedom is in our democratic U. S. Family. People like animals need food, shelter, and protection from enemies.

The book tells how the 13 colonies united into one family and grew in freedom under the Constitution. Freedom to develop one's talents, freedom of choice in work or worship—a great heritage worth appreciating early and guarding well.

This is an excellent book for the primary-grade book shelf.

ZINER, FEENIE AND THOMPSON, ELIZABETH. *The True Book of Time.* Chicago (Jackson Boulevard at Racine): Children's Press, 1956. Unpaged. $2.00.

This book for primary-graders leads the reader to understand the measurement of time, and helps him, with pictures and simple text, toward independence in telling time for himself.

The reader is introduced first to the height of the sun in telling time. Then telling time by a shadow stick, a sun dial, candle clock, burning rope, water clocks, and hour glass.

MARKS, MICKEY KLAR. *Fish on the Tide.* Chicago (Jackson Blvd. at Racine): Children's Press, 1956. Unpaged. $2.50.

Many boys (and their Dads) like to fish. But when a small boy sets out alone to fish, it leads to adventure. Danny sees lots of things along the shore as he goes fishing—animals, birds, seashells, boats. And he catches a fish too!

Pictures in color are by Irma Wilde. This is a fine book for the primary graders.

CLARK, MARY LOU. *You and How the World Began.* Chicago (Jackson Boulevard and Racine Avenue): Children's Press, 1957. 63 P. $2.00.

This book explains in simple terms two, until recently widely held, theories regarding the formation of the planet Earth—the Tidal Theory and the Nebular Theory. The author traces the development of life from the simplest marine life to early man.

The book is suitable for ten-to-fourteen-year olds. Illustrations are by George Rhoads.

FRISKEY, MARGARET. *Chicken Little Count-to-Ten.* Chicago (Jackson Boulevard at Racine): Children's Press, 1957. Unpaged. $1.00.

Chicken Little does not remember how chickens drink. He tries without luck the drinking methods of other animals—a cow, two elephants, three camels, four colts, five pigs, six toads, seven monkeys, eight kittens, nine puppies, and ten foxes.

There are gay illustrations in color by Katherine Evans. The book is suitable for four-to-seven-year olds who will thoroughly enjoy the pictures and the story. They will learn how to count to ten.

BALLARD, LOIS. *The True Book of Reptiles.* Chicago (Jackson Boulevard at Racine): Children's Press, 1957. 47 P. $2.00.

This *True Book* compares reptiles and other animals, how reptiles are alike, reptiles with shells on their backs, reptiles with four legs that live on land, reptiles with four legs that live in water, reptiles with no legs, and reptile babies. Pictures in color and black-and-white are by Irma Wilde.

This is a fine book for six-to-nine year olds.

The book was prepared under the direction of Illa Podendorf, Laboratory School of the University of Chicago.

MORRIS, PERCY A. *Boy's Book of Frogs, Toads, and Salamanders.* New York (15 East 26th Street): The Ronald Press Company, 1957. 240 P. $4.00.

This book describes and illustrates all of the common amphibians of North America. Habits, physical characteristics and life histories of frogs, toads, and salamanders are described. The book tells where to look for amphibians, how to capture them and how to identify them. There are some 75 photographs to aid in identification. There are introductory chapters on amphibian characteristics and how to collect and preserve them.

The author is a noted science writer and authority. He is chief preparator of the Peabody Museum in New Haven.

This book is recommended as a fine book for elementary science teachers as well as beginners in the study of the amphibians.

PEATTIE, DONALD CULROSS. *The Rainbow Book of Nature.* Cleveland, Ohio (2231 West 110th Street): The World Publishing Company, 1957. 320 P. $4.95.

This is an unusually fine nature book for boys and girls. The subject-matter content runs the gamut of animal and plant life, told in an unusually interesting literary style. Many interesting and unusual incidents and facts are interspersed in the reading material. Boys and girls will find the book easy to read and understand.

The book is richly illustrated in vivid colors and black-and-white by Rudolf Freund. This book reveals the glories of the sea, the forest, meadow, and marsh. Curiosity is not only stimulated but also satisfied. Considering the comprehensive content, the 250 unusually fine illustrations, and the low relative cost this is an unusually fine book for the science book shelf from the middle grades upward. Elementary teachers general science, and biology teachers will find this a stimulating book to read and a handy reference.

JOHN, BETTY. *Seloe.* Cleveland (2231 West 110th Street): The World Publishing Company, 1955. 185 P. $2.50.

Seloe is the story of the varied experiences of a fur seal's life from birth to adulthood. Seloe had to learn in one brief summer how to live independently. Then it becomes a constant struggle for existence. Danger lurks everywhere: in the sea from killer whales, Arctic Medusas, Octopuses, and so on; on land primarily man and other seals. Each spring thousands of seals make the arduous swim from southern waters to the Pribilof Islands in the Bering Sea where the young are born.

The account is based to a large degree on a diary kept by the author's grandmother—the first white woman to live on the Pribilof Islands. The book is illustrated in black and white by the author. It is suitable reading for boys and girls 10 to 14 years of age. It would make a fine addition to the science book shelf.